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# EXPERIMENT STATION RECORD

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## CONTENTS OF VOLUME 83

### EDITORIALS

| | Page |
|---|---|
| The Eighth American Scientific Congress | 1 |
| Work and expenditures of the agricultural experiment stations in 1939, by Frederick V. Rand | 145 |
| Closer inter-American relations in agricultural education and research | 289 |
| Experiment station research in veterinary medicine | 433 |
| The Department of Agriculture Appropriation Act, 1941 | 577 |
| Dean Mumford's evaluation of the land-grant college movement | 721 |

### STATION PUBLICATIONS ABSTRACTED

ALABAMA STATION:

| | |
|---|---|
| Bulletin 247 | 691 |
| Bulletin 248 | 794 |
| Circular 84 | 519 |

| | Page |
|---|---|
| ARIZONA STATION: | |
| Bulletin 167 | 260 |
| Bulletin 168 | 233 |
| Bulletin 169 | 744 |
| Bulletin 170 | 808 |
| Technical Bulletin 83 | 164 |
| Technical Bulletin 84 | 561 |
| ARKANSAS STATION: | |
| Bulletin 386 (Fifty first Annual Report 1939) | 22, 43, 47, 56, 64, 68, 84, 94, 113, 115, 123, 125, 127, 142, 143 |
| Bulletin 387 | 187 |
| Bulletin 388 | 557 |
| Bulletin 389 | 637 |
| Bulletin 390 | 768 |
| Bulletin 391 | 639 |
| Bulletin 392 | 626 |
| Bulletin 393 | 760 |
| CALIFORNIA STATION: | |
| Bulletin 633 | 191 |
| Bulletin 634 | 55 |
| Bulletin 635 | 532 |
| Hilgardia, volume 13— | |
| No. 1, January 1940 | 31 |
| No. 2, February 1940 | 337 |
| No. 3, April 1940 | 663, 664 |
| Mimeographed Report 69 | 267 |
| Mimeographed Report 70 | 691 |
| Mimeographed Report 71 | 692 |
| Mimeographed Report 72 | 840 |
| Mimeographed Report 73 | 840 |
| COLORADO STATION: | |
| Bulletin 458 | 338 |
| Bulletin 459 | 618 |
| Technical Bulletin 27 | 268 |
| Colorado Farm Bulletin, volume 2— | |
| No. 2, April–June 1940 | 186, 189, 190, 209, 235, 243, 255 |
| No. 3, July–September 1940 | 754, 787, 808, 843, 863 |
| CONNECTICUT [NEW HAVEN] STATION: | |
| Bulletin 432 | 354 |
| Bulletin 433 | 446, 485, 505, 517 |
| Bulletin 434 | 651 |
| Circular 142 | 594 |
| DELAWARE STATION: | |
| Bulletin 220 (Annual Report 1939) | 6, 22, 48, 57, 68, 85, 94, 116, 143 |
| FLORIDA STATION: | |
| Bulletin 338 | 49 |
| Bulletin 339 | 121 |
| Bulletin 340 | 309 |
| Bulletin 341 | 450 |
| Bulletin 342 | 78 |
| Bulletin 343 | 341 |

FLORIDA STATION—Continued. Page
Bulletin 344 357
Bulletin 345 644
Bulletin 346 680
Annual Report 1939 581, 589, 592, 616, 624, 634, 650, 665, 677, 687, 693, 699, 718

GEORGIA STATION:
Bulletin 204 187
Circular 121 189

GEORGIA COASTAL PLAIN STATION:
Bulletin 30 (Nineteenth Annual Report 1939) 589, 616, 625, 635, 654, 666, 718

HAWAII STATION:
Bulletin 85 808
Circular 15 825
Circular 16 772
Report 1939 448, 479, 488, 500, 517, 528, 562, 574

IDAHO STATION:
Bulletin 232 258
Bulletin 234 549
Bulletin 235 547

ILLINOIS STATION:
Bulletin 464 336
Bulletin 465 554
Circular 502 392
Circular 503 691
Circular 504 627
Circular 505 656
Circular 506 833
Circular 507 772
AE–1445, Financial Results of the Operations of Farmers' Elevators in Illinois in 1938 and 1939, L. J. Norton and G. W. Freemyer 839

INDIANA STATION:
Bulletin 441 263
Bulletin 442 262
Bulletin 443 264
Bulletin 444 632
Circular 252 189
Circular 253 670

IOWA STATION:
Bulletin P2, new series 51
Bulletin P3, new series 215
Bulletin P4, new series 96
Bulletin P5, new series 556
Bulletin P6, new series 191
Bulletin P7, new series 197
Bulletin P8, new series 482
Bulletin P9, new series 549
Bulletin P10, new series 491
Bulletin P11, new series 549
Bulletin P12, new series 496
Bulletin P13, new series 828

| | Page |
|---|---|
| Iowa Station—Continued. | |
| Research Bulletin 268 | 103 |
| Research Bulletin 269 | 66 |
| Research Bulletin 270 | 120 |
| Research Bulletin 271 | 550 |
| Research Bulletin 272 | 552 |
| Annual Report 1939, part 2 | 6, 22, 50, 58, 68, 85, 96, 113, 116, 143 |
| Kansas Station: | |
| Bulletin 287 | 384 |
| Bulletin 288 | 51 |
| Bulletin 290 | 338 |
| Technical Bulletin 48 | 367 |
| Circular 198 | 363 |
| Fort Hays Substation, Beef Cattle Investigations, 1938–39 | 384 |
| Annotated List of the Plants of Kansas: Ferns and Flowering Plants, F. C. Gates | 596 |
| Kentucky Station: | |
| Bulletin 398 | 376 |
| Bulletin 399 | 354 |
| Bulletin 400 | 547 |
| Bulletin 401 | 800 |
| Bulletin 402 | 815 |
| Fifty-second Annual Report 1939, part 1 | 436, 455, 479, 488, 501, 518, 528, 535, 540, 551, 557, 572, 574 |
| Fifty-second Annual Report 1939, part 2 | 574 |
| Louisiana Station: | |
| Bulletin 313 | 7 |
| Bulletin 314 | 259 |
| Bulletin 315 | 261 |
| Bulletin 316 | 262 |
| Bulletin 317 | 260 |
| Circular 23 | 187 |
| Circular 24 | 187 |
| Circular 25 | 187 |
| Circular 26 | 187 |
| M-M 1 | 689 |
| Maine Station: | |
| Bulletin 397 (Report 1939) | 302, 306, 309, 333, 335, 344, 363, 405, 410, 430 |
| Bulletin 398 | 694 |
| Maryland Station: | |
| Bulletin 431 | 407 |
| Massachusetts Station: | |
| Bulletin 367 | 159 |
| Bulletin 368 | 790 |
| Bulletin 369 (Annual Report 1939) | 725, 740, 745, 757, 759, 771, 783, 796, 813, 823, 828, 834, 843, 862 |
| Control Series Bulletin 99 | 233 |
| Control Series Bulletin 100 | 168 |
| Control Series Bulletin 101 | 168 |
| Control Series Bulletin 102 | 335 |

| | Page |
|---|---|
| MICHIGAN STATION: | |
| Special Bulletin 301 | 119 |
| Special Bulletin 302 | 409 |
| Technical Bulletin 169 | 60 |
| Technical Bulletin 170 | 97 |
| Technical Bulletin 171 | 429 |
| Technical Bulletin 172 | 307 |
| Quarterly Bulletin, volume 22— | |
| No. 3, February 1940 | 16, 17, 50, 52, 53, 54, 93, 95, 98, 100, 101, 102, 117, 126 |
| No. 4, May 1940 | 438, 449, 479, 483, 484, 487, 489, 490, 524, 527, 536, 540, 542, 560 |
| MINNESOTA STATION: | |
| Bulletin 346 | 117 |
| Bulletin 347 | 689 |
| Bulletin 347, Supplement | 690 |
| Bulletin 348 | 823 |
| Technical Bulletin 139 | 140 |
| Technical Bulletin 140 | 92 |
| Technical Bulletin 141 | 65 |
| Technical Bulletin 142 | 657 |
| Forty-sixth Annual Report 1939 | 293, 303, 325, 339, 368, 379, 409, 411, 427, 430 |
| MISSISSIPPI STATION: | |
| Bulletin 339 | 765 |
| Bulletin 340 | 64 |
| Bulletin 346 | 861 |
| Special Bulletin, December 1939 | 48, 143 |
| Mississippi Farm Research, volume 3— | |
| No. 2, February 1940 | 19, 48, 58, 64, 67, 79, 97, 142, 143 |
| No. 3, March 1940 | 168, 185, 193, 198, 223, 234, 236, 262, 287 |
| No. 4, April 1940 | 479, 520, 525, 528, 548 |
| No. 5, May 1940 | 452, 455, 479, 490, 491, 496, 523, 535, 562 |
| No. 6, June 1940 | 617, 652, 666, 688, 718 |
| No. 7, July 1940 | 740, 759, 779, 798, 805, 861 |
| MISSOURI STATION: | |
| Bulletin 413 | 159, 182, 185, 189, 201, 217, 229, 238, 242, 255, 257, 269, 286, 287 |
| Bulletin 414 | 99 |
| Bulletin 415 | 259 |
| Bulletin 416 | 194 |
| Bulletin 417 | 745 |
| Bulletin 418 | 798 |
| Bulletin 419 | 862 |
| Research Bulletin 311 | 78 |
| Research Bulletin 312 | 266 |
| Research Bulletin 313 | 194 |
| Research Bulletin 314 | 153 |
| Research Bulletin 315 | 672 |
| Research Bulletin 316 | 659 |
| Research Bulletin 317 | 759 |
| Research Bulletin 318 | 861 |
| Circular 205 | 90 |
| Circular 206 | 188 |

**Missouri Station**—Continued. Page

- Circular 207 ........ 685
- Circular 208 ........ 631
- Circular 209 ........ 806

**Montana Station:**

- Bulletin 377 ........ 258
- Bulletin 378 ........ 167
- Bulletin 379 ........ 276
- Circular 156 ........ 623
- Forty-fifth Annual Report 1938 ........ 718

**Nebraska Station:**

- Bulletin 325 ........ 114
- Bulletin 326 ........ 622
- Bulletin 327 ........ 662
- Bulletin 328 ........ 617
- Bulletin 329 ........ 768
- Research Bulletin 117 ........ 186
- Research Bulletin 118 ........ 546
- Research Bulletin 119 ........ 533
- Circular 61 ........ 87
- Circular 62 ........ 519
- Circular 63 ........ 483
- Circular 64 ........ 550
- Fifty-third Annual Report [1939] ........ 740, 741, 759, 771, 783, 796,, 805, 814, 825, 828, 835, 845, 862

**Nevada Station:**

- Bulletin 151 ........ 118
- Bulletin 152 ........ 189
- Bulletin 153 ........ 809
- Farm Management Bulletin, volume 1, No. 1, June 15, 1940 ........ 692
- Annual Report 1939 ........ 446, 448, 481, 529, 536, 540, 548, 574

**New Hampshire Station:**

- Bulletin 317 ........ 31
- Bulletin 318 ........ 265
- Bulletin 319 (Annual Report 1939) ........ 742, 760, 771, 779, 783, 796, 805, 814, 823, 832, 835, 863
- Bulletin 320 ........ 761
- Scientific Contribution 73 ........ 32

**New Jersey Stations:**

- Bulletin 670 ........ 193
- Bulletin 671 ........ 101
- Bulletin 672 ........ 189
- Bulletin 673 ........ 482
- Bulletin 674 ........ 314
- Bulletin 675 ........ 240
- Bulletin 676 ........ 619
- Bulletin 677 ........ 618
- Bulletin 678 ........ 650
- Bulletin 679 ........ 649
- Circular 395 ........ 228
- Circular 397 ........ 197

NEW JERSEY STATIONS—Continued. Page
Circular 398 ... 31
Circular 399 ... 597
Circular 400 ... 390
Hints to Poultrymen, volume 27—
*No. 1, October–November 1939* ... 237
No. 2, December 1939–January 1940 ... 389
No. 3, February–March 1940 ... 390
*No. 4, April–May 1940* ... 671
Plant Disease Notes, volume 17—
No. 7, October 1939 ... 76
*No. 8, November 1939* ... 76
No. 12, March 1940 ... 645
Annual Report 1939 ... 592, 597, 617, 625, 628, 631, 635, 651, 671, 676, 677, 687, 688, 718

NEW MEXICO STATION:
Bulletin 266 ... 365
Bulletin 267 ... 258
Bulletin 268 ... 421
Bulletin 269 ... 590
Bulletin 270 ... 619
Bulletin 271 ... 760
Fiftieth Annual Report 1939 ... 48, 57, 69, 85, 95, 100, 114, 116, 126, 143

[NEW YORK] CORNELL STATION:
Bulletin 728 ... 690
Bulletin 729 ... 692
Bulletin 730 ... 809
Bulletin 731 ... 832
Bulletin 732 ... 772
Bulletin 733 ... 840
Memoir 229 ... 497
Memoir 230 ... 774

NEW YORK STATE STATION:
Bulletin 688 ... 802
Bulletin 689 ... 626
Bulletin 690 ... 701
Bulletin 691 ... 775
Technical Bulletin 252 ... 302
Circular 189 ... 340
Circular 190 ... 659
Farm Research, volume 6—
No. 2, April 1, 1940 ... 156, 188, 191, 193, 194, 198, 207, 211, 217, 223, 241
No. 3, July 1, 1940 ... 770, 772, 775, 776, 788, 794, 815, 818, 848, 862

NORTH CAROLINA STATION:
Bulletin 326 ... 389
Technical Bulletin 62 ... 401
Agronomy Information Circular 125 ... 188

NORTH DAKOTA STATION:
Bulletin 292 ... 628
Bulletin 293 ... 842

**North Dakota Station**—Continued.

Bimonthly Bulletin, volume 2— Page

No. 3, January 1940 ........ 49, 55, 77, 99

No. 4, March 1940 ........ 216, 226, 236, 256, 267, 287

No. 5, May 1940 ........ 481, 488, 503, 515, 553, 560

No. 6, July 1940 ........ 742, 803, 840, 842, 844, 863

**Ohio Station:**

Bulletin 600 (Fifty-seventh Annual Report 1938) ........ 439, 446, 448, 480, 488, 497, 501, 518, 529, 535, 540, 548, 551, 562, 573, 574

Bulletin 609 ........ 265

Bulletin 610 ........ 184

Bulletin 611 ........ 37

Bulletin 612 ........ 688

Bimonthly Bulletin 201 ........ 96, 97, 116

Bimonthly Bulletin 202 ........ 20, 75, 116

Bimonthly Bulletin 203 ........ 195, 198, 210, 237, 257

Bimonthly Bulletin 204 ........ 740, 777, 778, 788, 803, 833, 835

Special Circular 60 ........ 772

**Oklahoma Station:**

Bulletin 240 ........ 257

Bulletin 242 ........ 668

Bulletin 243 ........ 812

Technical Bulletin 8 ........ 650

Technical Bulletin 9 ........ 696

Circular 86 ........ 74

Circular 87 ........ 188

Circular 88 ........ 696

Circular 89 ........ 207

Circular 90 ........ 486

Current Farm Economics, volume 13—

No. 1–2, February–April 1940 ........ 405

No. 3, June 1940 ........ 689

**[Oklahoma] Panhandle Station:**

Panhandle Bulletin 65 ........ 190

**Oregon Station:**

Circular of Information 207 ........ 74

Circular of Information 208 ........ 351

**Pennsylvania Station:**

Bulletin 385 ........ 124

Bulletin 386 ........ 64

Bulletin 387 ........ 375

Bulletin 388 ........ 841

Bulletin 389 ........ 813

Bulletin 390 ........ 367

Bulletin 391 ........ 807

Bulletin 393 ........ 773

Bulletin 394 ........ 779

Bulletin 395 ........ 814

Bulletin 396 ........ 831

Bulletin 397 ........ 809

Bulletin 398 ........ 742

PUERTO RICO COLLEGE STATION: Page
Bulletin 51 835
Journal of Agriculture of the University of Puerto Rico, volume 24, No. 1, January 1940 805, 806
Annual Report 1939 581, 593, 617, 625, 635, 651, 666, 677, 689, 718

RHODE ISLAND STATION:
Bulletin 271 334
Bulletin 272 337
Bulletin 273 399
Bulletin 274 406
Miscellaneous Publication 6 333
Annual Fertilizer Circular, 1940 594

SOUTH CAROLINA STATION:
Bulletin 325 408
Bulletin 326 841
Bulletin 327 837
Bulletin 328 838
Bulletin 329 806
Fifty-second Annual Report 1939 439, 448, 480, 488, 501, 518, 529, 535, 540, 548, 551, 562, 574, 769

SOUTH DAKOTA STATION:
Bulletin 332 410
Bulletin 333 403
Bulletin 334 558
Bulletin 335 533
Bulletin 336 589
Bulletin 337 671
Bulletin 338 696
Bulletin 339 774
Bulletin 340 801
Bulletin 341 835
Circular 27 246
Circular 28 756
Circular 29 842
Circular 30 829

TENNESSEE STATION:
Bulletin 171 403
Circular 67 621
Agricultural Economics and Rural Sociology Department—
Monograph 100 118
Monograph 101 256
Monograph 103 265
Monograph 104 554
Monograph 105 557
Monograph 107 553
Monograph 108 553
Monograph 110 553
Fifty-first Annual Report 1938 436, 448, 481, 489, 501, 519, 529, 535, 561, 564, 574

| | Page |
|---|---|
| TEXAS STATION: | |
| Bulletin 581 | 22 |
| Bulletin 582 | 232 |
| Bulletin 583 | 390 |
| Bulletin 584 | 206 |
| Bulletin 585 | 544 |
| Circular 87 | 81 |
| Circular 88 | 863 |
| Circular 89 | 776 |
| UTAH STATION: | |
| Bulletin 291 | 258 |
| Circular 113 | 273 |
| Farm and Home Science, volume 1— | |
| No. 1, March 1940 | 304, 334, 335, 357, 385, 391, 406, 412, 430 |
| No. 2, June 1940 | 482, 507, 523, 532, 535, 540, 548, 559, 569 |
| VERMONT STATION: | |
| Bulletin 456 | 593 |
| Bulletin 457 | 676 |
| Bulletin 458 | 666 |
| Bulletin 459 | 667 |
| Bulletin 460 | 744 |
| Bulletin 461 | 816 |
| Bulletin 462 | 837 |
| VIRGINIA TRUCK STATION: | |
| Bulletin 103 | 369 |
| WASHINGTON STATION: | |
| Bulletin 384 (Forty-ninth Annual Report 1939) | 150, 160, 185, 190, 202, 217, 229, 238, 242, 256, 268, 287 |
| Bulletin 385 | 258 |
| WESTERN WASHINGTON STATION: | |
| Report 1939 | 160, 185, 190, 202, 217, 236, 238, 253, 287 |
| WEST VIRGINIA STATION: | |
| Bulletin 295 | 233 |
| WISCONSIN STATION: | |
| Bulletin 445 | 78 |
| Bulletin 446 | 6, 42, 49, 82, 95, 101, 105, 114, 116, 123, 126, 142, 143 |
| Bulletin 447 | 270 |
| Bulletin 448 | 334 |
| Bulletin 449 (Annual Report 1939, part 2) | 306, 333, 335, 342, 344, 364, 382, 430 |
| WYOMING STATION: | |
| Bulletin 235 | 411 |
| Bulletin 236 | 334 |
| Bulletin 237 | 676 |
| Bulletin 238 | 808 |
| Bulletin 239 | 808 |
| Forty-ninth Annual Report 1939 | 446, 454, 481, 489, 501, 519, 530, 535, 541, 551, 562, 574 |

## UNITED STATES DEPARTMENT OF AGRICULTURE PUBLICATIONS ABSTRACTED


Technical Bulletin— Page

639. Effect of Accelerated Erosion on Silting in Morena Reservoir, San Diego County, California, F. F. Barnes, C. J. Kraebel, and R. S. LaMotte 29
648. Comparative Susceptibility of Crop Plants to Sodium Chlorate Injury, A. M. Hurd-Karrer 72
657. Physiological Studies of Jerusalem-Artichoke Tubers with Special Reference to the Rest Period, C. E. Steinbauer 458
692. Chemical and Mechanical Methods of Ribes Eradication in the White Pine Areas of the Western States, H. R. Offord, G. R. Van Atta, and H. E. Swanson 82
695. Some Principles of Accelerated Stream and Valley Sedimentation, S. C. Happ, G. Rittenhouse, and G. C. Dobson 741
696. The Behavior of Boron in Soils, F. M. Eaton and L. V. Wilcox 314
697. Testing Vinifera Grape Varieties Grafted on Phylloxera-Resistant Rootstocks in California, G. C. Husmann, E. Snyder, and F. L. Husmann 62
698. Rainfall Characteristics as Related to Soil Erosion, D. I. Blumenstock 20
704. Bacterial Wilt of Lespedeza, T. T. Ayers, C. L. Lefebvre, and H. W. Johnson 76
705. Differences in Growth Characters and Pathogenicity of Fusarium Wilt Isolations Tested on Three Tomato Varieties, F. L. Wellman and D. J. Blaisdell 212
707. The Vitamin $B_1$ Content of Foods in Terms of Crystalline Thiamin, L. E. Booher and E. R. Hartzler 131
708. A Study of Rapid Deterioration of Vegetable Seeds and Methods for Its Prevention, V. R. Boswell, E. H. and V. K. Toole, and D. F. Fisher 487
709. Supply Responses in Milk Production in the Cabot-Marshfield Area, Vermont, R. H. Allen, E. Hole, and R. L. Mighell 555
711. Economic Status of the English Sparrow in the United States, E. R. Kalmbach 792
712. Marketing Commercial Lettuce, R. L. Spangler 121
713. Types of Vegetation in Escalante Valley, Utah, as Indicators of Soil Conditions, H. L. Shantz and R. L. Piemeisel 743
714. Stains of Sapwood and Sapwood Products and Their Control, T. C. Scheffer and R. M. Lindgren 361
715. Keys to the Parasites of the Hessian Fly Based on Remains Left in the Host Puparium, C. C. Hill and J. S. Pinckney 92
716. Investigations on the Physical and Chemical Properties of Beeswax, C. S. Bisson, G. H. Vansell, and W. B. Dye 308
717. Beef Production and Quality as Affected by Method of Feeding Supplements to Steers on Grass in the Appalachian Region, W. H. Black, R. L. Hiner, L. B. Burk, L. M. Alexander, and C. V. Wilson 233
718. Fertilizer Experiments with Rice in California, L. L. Davis and J. W. Jones 484
719. Prevention of Damage by the Seed-Corn Maggot to Potato Seed Pieces, W. J. Reid, Jr., R. C. Wright, and W. M. Peacock 225

Technical Bulletin—Continued. Page

720. A Study of Methods in Barley Breeding, H. V. Harlan, M. L. Martini, and H. Stevens — 470
721. *Paradexodes epilachnae*, a Tachinid Parasite of the Mexican Bean Beetle, B. J. Landis and N. F. Howard — 373
722. Production and Consumption of Manufactured Dairy Products, E. E. Vial — 556
723. Biology of the Seed-Corn Maggot in the Coastal Plain of the South Atlantic States, W. J. Reid, Jr — 799
724. Milk and Butterfat Production by Dairy Cows on Four Different Planes of Feeding, R. R. Graves, G. Q. Bateman, J. B. Shepherd, and G. B. Caine — 536
725. Nutritive Properties of Certain Animal and Vegetable Fats, R. Hoagland and G. G. Snider — 269
726. Physical and Chemical Changes Produced in Bleached Cotton Duck by *Chaetomium globosum* and *Spirochaeta cytophaga*, R. E. Rogers, H. G. Wheeler, and H. Humfeld — 428

Farmers' Bulletin—

1826. Care of Ornamental Trees and Shrubs, F. L. Mulford — 199
1829. Insects and Diseases of the Pecan and Their Control, G. F. Moznette, C. B. Nickels, W. C. Pierce, T. L. Bissell, J. B. Demaree, J. R. Cole, H. E. Parson, and J. R. Large — 510, 519
1830. Cooperative Dairy Bull Associations, J. G. Winkjer — 238
1832. Farm Fences, M. A. R. Kelley — 257
1833. Crops Against the Wind on the Southern Great Plains, G. K. Rule — 165
1834. House Cleaning Management and Methods, C. W. Moffett — 287
1840. Kudzu for Erosion Control in the Southeast, R. Y. Bailey — 188
1841. The Feeding of Chickens, H. W. Titus — 97
1842. Production of Hops, G. R. Hoerner and F. Rabak — 491
1843. Potato Production in the Western States, W. C. Edmundson — 334
1844. The Culture and Use of Sorghums for Forage, J. H. Martin and J. C. Stephens — 485
1845. The Liming of Soils, E. C. Shorey — 455
1847. Rural Library Service — 125

Circular—

538. Some Factors Affecting Survival, Growth, and Selection of Lambs, R. W. Phillips and W. M. Dawson — 234
540. Cotton-Tillage Studies on Red Bay Sandy Loam, J. W. Randolph, I. F. Reed, and E. D. Gordon — 829
541. Estimating Weights of Lambs at a Constant Age, R. W. Phillips and G. W. Brier — 235
543. Two Rapid Methods for Estimating Fineness and Cross-Sectional Variability of Wool, J. I. Hardy and H. W. Wolf — 141
544. Methods of Ventilating Wheat in Farm Storages, C. F. Kelly — 687
545. Pecan Grafting Methods and Waxes, B. G. Sitton — 496
546. Putting Down and Developing Wells for Irrigation, C. Rohwer — 548
547. Feeding Habits of the Adult Japanese Beetle, I. M. Hawley and F. W. Metzger — 660
548. The Farm Real Estate Situation, 1936–37, 1937–38, and 1938–39, M. M. Regan — 118

Circular—Continued. Page

549. Proximate Composition of American Food Materials, C. Chatfield and G. Adams ... 690
550. S × P Cotton in Comparison with Pima, T. H. Kearney, R. H. Peebles, and E. G. Smith ... 484
551. The Basis for Treatment of Products Where Fruitflies Are Involved as a Condition for Entry Into the United States, A. C. Baker ... 93
552. Seven New Peaches and a New Plum for the Western States, W. F. Wight ... 196
553. Handling and Storing Small Lots of Dates at Home, W. R. Barger ... 63
554. Honey and Pollen Plants of the United States, E. Oertel ... 227
555. Fumigation of Vetch Seed for the Vetch Bruchid, A. C. Johnson, J. S. Pinckney, J. W. Bulger, and A. M. Phillips ... 227
558. Processing Seed of Grasses and Other Plants to Remove Awns and Appendages, J. L. Schwendiman, R. F. Sackman, and A. L. Hafenrichter ... 618
559. Review and Discussion of Literature Pertinent to Crop Rotations for Erodible Soils, C. R. Enlow ... 760
560. Rate of Growth by Dairy Calves and Heifers on Different Rations, R. R. Graves, J. R. Dawson, D. V. Kopland, J. A. Simms, A. G. Van Horn, and S. L. Cathcart ... 670
562. Maintaining Identity and Pure Seed of Southern Oat Varieties, T. R. Stanton ... 766
563. Relation of the Depth to Which the Soil Is Wet at Seeding Time to the Yield of Spring Wheat on the Great Plains, J. S. Cole and O. R. Mathews ... 622
565. Austrian Winter Field Pea Diseases and Their Control in the South, J. L. Weimer ... 786
566. The Ripening and Repacking of Mature-Green Tomatoes, R. C. Wright and E. A. Gorman, Jr ... 774
568. Factors Influencing the Use of Some Common Insecticide-Dispersing Agents, L. H. Dawsey ... 794

Leaflet—

188. Protecting Field Borders, V. E. Davison ... 30
194. The Oriental Persimmon, H. P. Gould ... 630
195. Mealworms, R. T. Cotton ... 377
196. The Ryegrasses, H. A. Schoth and M. A. Hein ... 764
197. Powdery Mildew of Ornamental Plants, F. Weiss ... 360
198. Cottonseed Treatment, R. J. Haskell and H. D. Barker ... 207

Miscellaneous Publication—

356. Family Income and Expenditures: Pacific Region and Plains and Mountain Region—I, Family Income, D. Monroe, D. S. Martin, M. Perry, and K. Cronister ... 286
359. The Cow Tester's Manual, J. F. Kendrick ... 239
360. Plans of Farm Buildings for Southern States ... 834
361. Descriptions of Types of Principal American Varieties of Orange-Fleshed Carrots, R. Magruder, V. R. Boswell, S. L. Emsweller, J. C. Miller, A. E. Hutchins, J. F. Wood, M. M. Parker, and H. H. Zimmerley ... 627

Page

Miscellaneous Publication—Continued.

367. Rural Population Density in the Southern Appalachians, F. J. Marschner ... 407
370. Family Income and Expenditures: Middle Atlantic and North Central Region and New England Region.—Part 1, Family Income, D. Monroe, E. Phelps, and I. G. Swisher ... 861
371. A Revision of the North American Aphids of the Genus *Myzus*, P. W. Mason ... 369
372. A Survey and Discussion of Lysimeters and a Bibliography on Their Construction and Performance, H. Kohnke, F. R. Dreibelbis, and J. M. Davidson ... 741
373. State Forests for Public Use ... 497
374. Descriptions of Types of Principal American Varieties of Red Garden Beets, R. Magruder, V. R. Boswell, H. A. Jones, J. C. Miller, J. F. Wood, L. R. Hawthorn, M. M. Parker, and H. H. Zimmerley ... 772
376. Directory of Organization and Field Activities of the Department of Agriculture, 1939, E. Stephens ... 267
378. Workers in Subjects Pertaining to Agriculture in Land-Grant Colleges and Experiment Stations, 1939–40, M. A. Agnew ... 559
379. The Farm Outlook for 1940 ... 117
380. Snow Surveying, J. C. Marr ... 738
382. A Revision of the Genus *Lycopersicon*, C. H. Muller ... 753
385. Sources of Heat for Cotton Drying, C. A. Bennett, V. L. Stedronsky, and W. J. Martin ... 831
386. Packaging Sliced Cheddar and Swiss Cheese in Cans for Sandwich Dispensers, H. L. Wilson ... 818

Inventory—

124. Plant Material Introduced by the Division of Plant Exploration and Introduction, Bureau of Plant Industry, July 1 to September 30, 1935 ... 324
125. Plant Material Introduced by the Division of Plant Exploration and Introduction, Bureau of Plant Industry, October 1 to December 31, 1935 ... 324
126. Plant Material Introduced by the Division of Plant Exploration and Introduction, Bureau of Plant Industry, January 1 to March 31, 1936 ... 594

Crops and Markets—

Volume 17—

No. 1, January 1940 ... 122
No. 2, February 1940 ... 267
No. 3, March 1940 ... 267
No. 4, April 1940 ... 556
No. 5, May 1940 ... 694
No. 6, June 1940 ... 694

Extension Pathologist—

No. 40, January 1940 ... 77
No. 41, April 1940 ... 356

Citations to Literature in the *Journal of Agricultural Research*, Technical Bulletins, Circulars, and Miscellaneous Publications (Other Than Bibliographies), C. Whitlock ... 863

| | Page |
|---|---|
| OFFICE OF EXPERIMENT STATIONS: | |
| Report on the Agricultural Experiment Stations, 1939, J. T. Jardine, F. D. Fromme, et al | 862 |
| EXTENSION SERVICE: | |
| For Better Rural Living: A Report of Cooperative Extension Work in Agriculture and Home Economics in 1938 | 698 |
| AGRICULTURAL ADJUSTMENT ADMINISTRATION: | |
| Farm Management Report 4, Operation of Agricultural Conservation Programs in Illinois, G. E. Toben and H. C. M. Case | 690 |
| Income Parity for Agriculture.—V, Population, Farms, and Farmers: Section 1, Farm Population, Nonfarm Population, and Number of Farms in the United States, 1910–39, E. W. Grove | 692 |
| Report of the Associate Administrator of the Agricultural Adjustment Administration, in Charge of the Division of Marketing and Marketing Agreements, and the President of the Federal Surplus Commodities Corporation, 1939, M. Perkins | 122 |
| BUREAU OF AGRICULTURAL CHEMISTRY AND ENGINEERING: | |
| ACE–29. Farm Operating Efficiency Investigations in Virginia, 1931–1938: Progress Report, A. T. Holman, J. L. Maxton, and G. D. Kite | 690 |
| BUREAU OF AGRICULTURAL ECONOMICS: | |
| Agricultural Economics Bibliography— | |
| No. 81. Transportation of Agricultural Products in the United States, 1920–June 1939, I–III, E. M. Colvin | 263 |
| No. 82. The World Food Supply: A Partial List of References, 1925–1939, M. T. Olcott | 555 |
| No. 83. Land Classification: A Selected Bibliography, O. E. Goodsell | 554 |
| No. 84. Agricultural Relief Measures Relating to the Raising of Farm Prices—74th Congress, January 3, 1935 to June 20, 1936, M. E. Wheeler | 553 |
| No. 85. Farm Tenancy in the United States, 1937–1939: A Selected List of References, J. M. McNeill | 554 |
| Economics Library List— | |
| No. 5–8 | 834 |
| No. 9. Cotton Picking Machinery: A Short List of References, E. L. Day | 831 |
| No. 10–12 | 834 |
| Farm Management Report— | |
| 1. Food, Feed, and Southern Farms: A Study of Production in Relation to Farm Needs in the South, O. Steanson and E. L. Langsford | 693 |
| 2. Organization and Crop Production Practices on Grain Farms in Selected Areas of the Northern Great Plains, R. S. Washburn | 691 |
| 3. Rural Rehabilitation Progress in Stearns County, Minnesota.—I, A Summary Analysis, W. R. Bailey | 690 |
| 4. Operation of Agricultural Conservation Programs in Illinois, G. E. Toben and H. C. M. Case | 690 |
| 5. Determining Input-Output Relationships in Milk Production, E. Jensen | 693 |

| | Page |
|---|---|
| BUREAU OF AGRICULTURAL ECONOMICS—Continued. | |
| 8. Production Responses of Dairy Farmers in East-Central Minnesota, E. G. Strand and E. Hole | 836 |
| 9. Tailoring Conservation Research to Fit the Needs of Farm Planning, N. W. Johnson | 835 |
| Considering Farm Adjustments in Subarea 33, Type of Farming Area VII, Montana, N. W. Johnson | 553 |
| Farm Population and Rural Life Activity, volume 14, No. 1, January 15, 1940 | 125 |
| Forces Causing Dairy Farmers to Make Changes in Their Farm Organizations in Barron County, Wisconsin, R. P. Christensen | 552 |
| Income Parity for Agriculture.—V, Population, Farms, and Farmers: Section 1, Farm Population, Nonfarm Population, and Number of Farms in the United States, 1910–39, E. W. Grove | 692 |
| Land Use Planning Under Way | 835 |
| Social Research Report 15, Standards of Living in Six Virginia Counties, D. M. Davidson, Jr., and B. L. Hummel | 408 |
| AGRICULTURAL MARKETING SERVICE: | |
| Digest of Decisions of the Secretary of Agriculture Under the Perishable Agricultural Commodities Act (revised, 1939), W. L. Evans | 122 |
| Grade, Staple Length, and Tenderability of Cotton in the United States, 1938–39 | 693 |
| Should Net-Weight Trading and Standards for Tare Be Adopted for American Cotton? J. W. Wright | 693 |
| BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE: | |
| E-484–495, [Contributions on Economic Insects, Insecticides, and Insect Control] | 216 |
| ET-152–157, [Contributions on Entomological Technic] | 83 |
| ET-153, A Portable Wind-Direction Recorder, R. A. Fulton | 18 |
| Report of the Chief of the Bureau of Entomology and Plant Quarantine, 1939, L. A. Strong | 67, 83 |
| FARM CREDIT ADMINISTRATION: | |
| Miscellaneous Report 23, Base Allotment or Quota Plans Used by Farmers' Cooperative Milk Associations, W. C. Welden and L. F. Herrmann | 839 |
| FARM SECURITY ADMINISTRATION: | |
| Social Research Report 15, Standards of Living in Six Virginia Counties, D. M. Davidson, Jr., and B. L. Hummel | 408 |
| OFFICE OF FOREIGN AGRICULTURAL RELATIONS: | |
| Foreign Agriculture— | |
| Volume 3, No. 12, December 1939 | 120 |
| Volume 4— | |
| No. 2, February 1940 | 120 |
| No. 3, March 1940 | 263 |
| No. 4, April 1940 | 263 |
| No. 5, May 1940 | 555 |
| No. 6, June 1940 | 555 |
| No. 7, July 1940 | 836 |
| F. S. 81. Tobacco Production and Consumption in the Netherlands Indies, J. B. Gibbs | 406 |
| F. S. 82. Tobacco Trade With Latin America, J. B. Gibbs | 836 |

FOREST SERVICE: Page
Cooperative Marketing of Forest Products—A Bibliography 407
Fire Control Notes, volume 4, No. 2, April 1940 343
Forest Outings, edited by R. Lord 779
List of Publications on Mechanical Properties and Structural Uses of Wood and Wood Products, October 1939 403
R1218, Simultaneous Production of Wood Pulp and the Conversion of the Noncellulosic Constituents of Wood Into Alcohols, Oils, and Resins, E. E. Harris and E. C. Sherrard 737
Taming Our Forests, M. B. Bruère 67
What Forests Give, M. B. Bruère 67

BUREAU OF HOME ECONOMICS:
Income Parity for Agriculture.—V, Population, Farms, and Farmers: Section 1, Farm Population, Nonfarm Population, and Number of Farms in the United States, 1910–39, E. W. Grove 692

BUREAU OF PLANT INDUSTRY:
[Soil Survey Report], Series 1933—
No. 31. Scioto County, Ohio, G. W. Conrey, A. H. Paschall, W. S. Mozier, M. Leatherman, R. N. Durr, and I. Hodson 160
No. 32. Soil Survey of Davis County, Iowa, C. L. Orrben and G. A. Swenson 593
[Soil Survey Report], Series 1934—
No. 17. Soil Survey of Otsego County, New York, W. E. Tharp et al 306
No. 19. Soil Survey of Osceola County, Iowa, C. L. Orrben et al 593
No. 20. Soil Survey of Stokes County, North Carolina, W. A. Davis and E. F. Goldston 306
[Soil Survey Report], Series 1935—
No. 12. Soil Survey of Cattaraugus County, New York, C. S. Pearson et al 448
No. 13. Cerro Gordo County, Iowa, J. A. Elwell, H. L. Dean, F. Rudolph, and E. W. Tigges 160
No. 14. Soil Survey of Albemarle County, Virginia, R. E. Devereux et al 306
[Soil Survey Report], Series 1936—
No. 2. Soil Survey of Major County, Oklahoma, W. H. Buckhannan et al 306
Plant Disease Reporter—
Volume 24—
No. 4, March 1, 1940 68
No. 5, March 15, 1940 68
No. 6, April 1, 1940 201
No. 7, April 15, 1940 201
No. 8, May 1, 1940 343
No. 9, May 15, 1940 343
No. 10, June 1, 1940 500
No. 11, June 15, 1940 500
No. 12, July 1, 1940 635
No. 13, July 15, 1940 635
No. 14, August 1, 1940 782
No. 15, August 15, 1940 782
Supplement 118, December 31, 1939 201

BUREAU OF PLANT INDUSTRY—Continued.

Plant Disease Reporter—Continued. Page

Supplement 121, March 1, 1940 ... 345

Supplement 122, May 1, 1940 ... 347

*Cercosporella* Foot Rot of Winter Grains in the Pacific Northwest, R. Sprague ... 350

Reaction of Winter Wheat Varieties to Loose Smut Infection at Texas Substation No. 6, Denton, Texas, 1938 and 1939, I. M. Atkins ... 503

Report of the Sixth Eastern Wheat Conference ... 770

Results From the Uniform Bunt Nurseries in the Western Region in 1939, with Averages for 1938, C. S. Holton and C. A. Suneson ... 503

Results of Experiments in Control of Bacterial Ring Rot of Potatoes in 1939, T. P. Dykstra ... 786

Sprays and Dusts for Florists and Gardeners ... 511

Summary of the Great Plains Uniform Winter Wheat Bunt Nursery, 1939, H. A. Rodenhiser and K. S. Quisenberry ... 503

SOIL CONSERVATION SERVICE:

Bibliography 1, Wind Erosion and Sand Dune Control: A Selected List of References, R. W. Moats ... 549

SCS-TP-27. Seed Propagation of Trees, Shrubs, and Forbs for Conservation Planting, C. F. Swingle ... 454

SCS-TP-29. Hydrologic Studies: Compilation of Rainfall and Run-Off From the Watersheds of the Upper Mississippi Valley Conservation Experiment Station, La Crosse, Wisconsin, 1932–38, O. E. Hays and H. B. Atkinson ... 21

SCS-TP-31. Hydrologic Studies: Compilation of Rainfall and Run-Off from the Watersheds of the Missouri Valley Loess Region Conservation Experiment Station, Clarinda, Iowa, 1934–38, L. H. Schoenleber ... 590

SCS-TP-32. Hydrologic Studies: Compilation of Rainfall and Run-Off from the Watersheds of the Red Plains Conservation Experiment Station, Guthrie, Oklahoma, 1931–38, J. W. Slosser ... 738

Erosion and Related Land Use Conditions on the Lake Michie Watershed, near Durham, North Carolina, I. L. Martin and T. C. Bass ... 454

Erosion and Related Land Use Conditions on the Lloyd Shoals Reservoir Watershed, Georgia, P. H. Montgomery ... 454

Erosion and Related Land Use Conditions on the Spartanburg Municipal Reservoir Watershed, South Carolina, T. C. Bass and I. L. Martin ... 454

Erosion and Related Land Use Conditions on the University Lake Watershed, Chapel Hill, North Carolina, T. C. Bass and I. L. Martin ... 454

Land-Saving Plans for Conservation in the Pacific Southwest, Region 10 ...

SUGAR DIVISION:

Report of the Chief of the Sugar Division, 1939, J. Bernhardt ... 693

WEATHER BUREAU:

Monthly Weather Review—

Volume 67—

No. 11, November 1939 ... 156

No. 12, December 1939 ... 156

WEATHER BUREAU—Continued.
Monthly Weather Review—Continued.
Volume 68— Page
No. 1, January 1940 446
No. 2, February 1940 446
No. 3, March 1940 590, 591
No. 4, April 1940 590, 591
Climatological Data, volume 26, Nos. 1-12, January-December, 1939 590
Circular S, Codes for Cloud Forms and States of the Sky According to the International System of Classification 158

## JOURNAL OF AGRICULTURAL RESEARCH

Journal of Agricultural Research—
Volume 59—
No. 10, November 15, 1939 9, 38, 42, 91, 98, 110
No. 11, December 1, 1939 43, 54, 74, 79, 87
No. 12, December 15, 1939 65, 77, 81
Volume 60—
No. 1, January 1, 1940 159, 176, 192, 232, 235
No. 2, January 15, 1940 445, 474, 492, 506, 512, 531
No. 3, February 1, 1940 461, 472, 473, 509, 520, 523, 538, 543
No. 4, February 15, 1940 496, 502, 510, 511, 524
No. 5, March 1, 1940 472, 483, 530, 544, 573
No. 6, March 15, 1940 583, 623, 642, 717
No. 7, April 1, 1940 601, 619, 645, 670
No. 8, April 15, 1940 746, 777, 823
No. 9, May 1, 1940 743, 785, 786, 802, 828
No. 10, May 15, 1940 754, 787

# EXPERIMENT STATION RECORD

Vol. 83 July 1940 No. 1


## THE EIGHTH AMERICAN SCIENTIFIC CONGRESS

Nearly 25 years have gone by since the Second Pan American Scientific Congress met in Washington as "the first assemblage in the name of science to be held in North America by representatives of the Western Hemisphere" (E. S. R., 34, p. 303). The 1940 successor to this gathering, known as the Eighth American Scientific Congress, returned to this country on May 10, meeting in Washington through May 17. The delegates also visited various points in Virginia and Maryland, lunched in Philadelphia as guests of the American Philosophical Society, and spent their final day of May 21 as participants in the special program arranged in their honor at the New York World's Fair.

Despite the change in terminology and the passage of a quarter century, the Congresses of 1915 and 1940 had much in common. Both were held under the auspices of the Government of the United States, and in both the delegates were official and institutional representatives of the 21 American Republics. Much attention was given through an extensive social program and in other ways to the fostering of a closer relationship among these Republics, and by a curious coincidence the feeling of solidarity was intensified in both Congresses by the fact that cataclysmic wars were raging abroad.

The 1940 Congress was formally opened in a special inaugural session on May 10 by President Franklin D. Roosevelt. Addressing those present as "fellow servants of the Americas," he deplored the fact that "this hemisphere is now almost the only part of the earth in which such a gathering can take place." In consequence of this situation, he declared, "the inheritance which we had hoped to share with every nation in the world is, for the moment, left largely in our keeping, and it is our compelling duty to guard and enrich that legacy, to preserve it for a world which must be reborn from the ashes of the present disaster." He also pointed out that "the great achievements of science and even of art can be used to destroy as well as create; they are only instruments by which men try to do the things they most want to do. If death is desired, science can do

that. If a full life is sought, science can do that also." "In the New World," he contended, "we live for each other and in the service of a Christian faith," and he predicted that "in the long run and if it be necessary," the 21 American Republics will, by overwhelming majorities, "act together to protect and defend by every means our science, our culture, our freedom, and our civilization."

The first plenary session was given over to an address of welcome by Hon. Cordell Hull, Secretary of State; responses by representatives of the various delegations; an address of Director General L. S. Rowe of the Pan American Union, which is this year celebrating the fiftieth anniversary of its founding; and an election of officers, at which the chairman of the organizing committee, Hon. Sumner Welles, Under Secretary of State, was made permanent chairman of the Congress. Especially significant were the remarks of Secretary Hull, who pointed out that "we are supremely fortunate that in this hemisphere thought is still free and science is still untrammeled." This is well, since "science cannot flourish when it is forced into the narrow confines of national frontiers. Its progress is founded upon a universal fellowship that knows no distinctions of race or creed or nationality of class or of group." This assembly of scientists symbolized, in his opinion, "full recognition of the great mutual benefits to be secured from fruitful relationships between government and government, group and group, individual and individual, who, though separated by national frontiers, have much to learn from each other and much to contribute to the whole of mankind."

The Congress brought together an estimated attendance of about 1,500, of whom about 300 were from the Republics of Central and South America. The total number of papers presented was well over 400, and many others were received for incorporation in the proceedings. The official languages were English, Spanish, Portuguese, and French, and special arrangements were made for the translation as a whole or in part of many of the papers as presented. Abstracts were also available to a considerable extent. Nevertheless, as in previous congresses, linguistic difficulties inevitably slowed down the proceedings and handicapped both formal and informal discussions, and the Congress registered its belief in the desirability of increased attention to the study of the four official languages in the various countries of the Western Hemisphere.

The organization of the Congress into 11 sections provided opportunity for the consideration of a wide scope of subject matter. The section of most immediate interest to readers of the *Record* was that on agriculture and conservation, but scattered through other sections were other papers of direct appeal. Mention may be made of the section of biological sciences, with consideration of genetics, ecology, microbiology, plant pathology, and economic botany and zoology;

public medicine, with its discussion of nutritional and related diseases; physical and chemical sciences, including meteorology and chemical technology; statistics, with a symposium on populations of the New World, with Secretary of Agriculture Henry A. Wallace serving as chairman and delivering the opening address and introductions in Spanish; history and biology, with a session on land occupancy and the frontier in the history of America; and economics, with its general subject the economic and social conditions and problems in the American Republics.

The section on agriculture and conservation was under the chairmanship of Dr. H. H. Bennett, Chief of the U. S. D. A. Soil Conservation Service, with Ernest G. Holt, Chief of the Biology Division of that Service, as secretary and J. L. Colom, chief of the division of agricultural cooperation of the Pan American Union, as assistant secretary. The presiding officers of its eight meetings were drawn from the various Republics which were represented. One afternoon was occupied by a tour of the Beltsville Research Center. A special exhibit in the patio of the Administration Building illustrated various phases of the work of the U. S. Department of Agriculture, and similar exhibits for the Grazing Service and the Bureau of Biological Survey of the Department of the Interior were on display in that Department.

The first paper on the section program was that of Secretary Wallace, entitled The Vital Role of Agriculture in Inter-American Relations. This address dealt especially with the need for an Inter-American institute at some suitable point in the Tropics for a study of tropical agriculture. Such an institute, he pointed out, would have as one of its functions the training of prospective investigators. It would also be equipped for work on difficult problems of production, such as those on rubber and other crops on which research is particularly needed. This proposal subsequently received endorsement by the Congress and the committee on agriculture of the governing board of the Pan American Union, which authorized the appointment of a committee consisting of representatives of the Governments of Brazil, Colombia, El Salvador, Guatemala, and Venezuela to study the possibilities for such an institute and make specific suggestions to the union for its establishment. The same committee was also given the duty of promoting and expediting the production of rubber in the Western Hemisphere.

Another address of general interest was that of Hon. Gifford Pinchot on Conservation as the Foundation of Permanent Peace. Well-known as a pioneer in the cause of the conservation, Dr. Pinchot reviewed attempts to arrange world conferences on the subject, and argued that the nations of the Western Hemisphere should be prepared to act in concert in this direction upon the return of peace.

He also suggested the establishment of a commission to assemble data and render other assistance. Later a recommendation was made by the Congress for an Inter-American Conservation Commission, cooperating with the Pan American Union, to inventory the natural resources of the world. The governing board of the Pan American Union approved the formation of such a group, to be known as the Pan American Resources Commission and made up of one representative each from the 21 American Republics. In addition, recommendations were adopted for a similarly constituted Pan American Soil Conservation Commission and for the development of systematic agricultural surveys of the Latin American countries designed to indicate what new noncompetitive tropical or semitropical products may be produced in these countries for sale in the United States.

Of special significance from a research standpoint was a paper by Dr. M. A. McCall, Assistant Chief of the Bureau of Plant Industry, entitled Agricultural Research and Conservation. This was primarily a plea for a dynamic research program, with "facts, facts, and still more facts" as "the foundation of policies and action." "True conservation," he pointed out, "means not only wise use and maintenance, but above all the elimination of unnecessary wastes and a cost proportional to the true value of the resource. This can be attempted only when founded upon sound knowledge." As the first step, he advocated an inventory of resources to be used and conserved, especially the survey, classification, and mapping of the soils, and the study of each important climatic and soil province to develop principles and practices for these specific areas. Similar inventories should be made, he averred, for soil amendments and fertilizer resources and their proper use.

Particular stress was laid on the risk of defeat in conservation programs through inadequate knowledge. "Millions of acres of both public and private lands now under insufficient cover because of drought or mismanagement remain unproductive and poorly protected against erosion because of too little information and lack of proper grass species. The urge to undertake extensive regrassing on only a minor part of this immense domain easily could result in wastes that would pay the costs of necessary research to get information and materials many times over."

In his discussion of the principles underlying research of this type, Dr. McCall pointed out the need of sufficient time. "The remedies for the various critical plant problems which may arise from time to time cannot be drawn out of thin air as desired, but usually require long and patient research for their development. We are now making the results of past research our safeguard in present crises, and future crises must be met with the results of present research. Hybrid corn, for example, took 30 years to become a reality, and the

stem rust-resistant Thatcher wheat represents 25 years of patient effort. We cannot afford to wait for the problem to become cataclysmic before attacking it. We lost our immensely valuable American chestnuts because we waited too long."

Other papers contributed from the United States to the section dealt rather specifically with such matters as soil, forest, and wildlife conservation, the role of reclamation, and the need for planning for better land use. Those from other countries were concerned for the most part with conditions in their respective regions. As typical among them may be mentioned The Role of Research in the Puerto Rican Cane Industry, by Dean R. Menéndez Ramos of the University of Puerto Rico; Soil Conservation in Puerto Rico and Its Influence Upon the Agricultural Economy of the Island, by Director J. A. B. Nolla of the Puerto Rico College Experiment Station; Agriculture and Cattle Raising in Venezuela, by R. Alamo Ybarra; and The Problem of Soil Erosion and Its Importance to Chile, by Manuel Elgueta Guerin.

Much information was made available by the papers presented, and very likely even more was accomplished by the personal contacts. A desire to make definite progress in relationships was clearly evident, and with this came a realization of a need for more frequent meetings and closer professional associations. One of the outstanding accomplishments of the Congress from the point of view of agricultural research was the appointment of a committee to organize immediately a society for the promotion of agricultural science in the Western Hemisphere. This committee acted promptly, and the American Society of Agricultural Sciences has already been definitely inaugurated. The first president is Ernest G. Holt of the U. S. D. A. Soil Conservation Service, and the secretary general is José L. Colom of the Pan American Union. It is hoped to hold meetings at least every 2 or 3 years, and plans are already under way for the first of these meetings in Habana, Cuba, in conjunction with the Ninth American Scientific Congress. Further information regarding the society will appear in the *Record* at an early date.

# RECENT WORK IN AGRICULTURAL SCIENCE

## AGRICULTURAL AND BIOLOGICAL CHEMISTRY

**[Chemical investigations of the Delaware Station]** (*Delaware Sta. Bul. 220 (1939), pp. 18, 19, 20*).—These have included the extraction of phospholipoids from soybean oil meal, by A. A. Horvath; and a study of the factors that induce jellying, by G. L. Baker and M. W. Goodwin.

**[Chemical investigations of the Iowa Station]** (*Iowa Sta. Rpt. 1939, pt. 2, pp. 64–72, 73–75*).—Report is briefly made upon certain chemical and physical characteristics of corn and sorghum as these relate to industrial utilization, by R. M. Hixon, W. G. Gaessler, and A. A. Bryan; certain chemical and physical characteristics of sweet corn pericarp as these relate to its toughness, by Hixon, Gaessler, and E. S. Haber; oxidation of cornstarch, by Hixon and R. S. Bear; a characterization of the products of starch degradation by enzyme, by N. M. Naylor; identification of the compounds responsible for the odor of yellow corn, by Hixon; absorption spectra of starch-iodine complexes, by Hixon and F. H. Spedding; fractionation and characterization of corn protein, by Bear and Gaessler; utilization of agricultural products in the fermentative production of lactic acid, by C. H. Werkman; elasticity and viscosity as starch characteristics, by Hixon and Bear; and development of laboratory control technics for cornstarch production, including rheological studies, by Hixon.

**[Chemical and bacteriological investigations of the Wisconsin Station]** (*Wisconsin Sta. Bul. 446 (1939), pp. 57–59*).—Work is briefly noted on prevention of softening of dill pickles, by R. F. DeLong and W. C. Frazier; on a quick method of producing lactic acid, by S. C. Pan, M. J. Johnson, E. McCoy, W. H. Peterson, E. E. Snell, F. M. Strong, and N. Rodgers; on activation of proteolytic enzymes by metals, by J. Berger and Johnson; and on a new growth factor for cultures of legume-nodule bacteria, by P. W. Wilson and P. M. West.

**Surface migration of ions and contact exchange**, H. Jenny and R. Overstreet. (Univ. Calif.). (*Jour. Phys. Chem., 43 (1939), No. 9, pp. 1185–1196, figs. 12*).—A proposed theory of ionic movement in colloidal systems involves ions held in the adsorbed state on the surfaces of the micelles. The theory is used to interpret observations on the migration of ferrous iron in gels and sols of the bentonitic clays. It is postulated that the ions diffuse on the surface of the colloidal particles and "jump" from one particle to another. The theory suggests a new mode of mineral nutrition of plants in soils, based on interpenetrating double layers of root colloids and soil colloids. It is shown that roots in contact with clay particles both gain and lose nutrient cations.

**Chemical preparation of colloidal suspensions in non-aqueous solvents.—I, Methyl alcohol and benzene; II, Ether, dioxane, and acetone**, A. A. Vernon and H. A. Nelson. (R. I. State Col.). (*Jour. Phys. Chem., 44 (1940), No. 1, pp. 12–20, 21–25*).—The first two papers of this series report upon preparations obtained by the reduction of salts of the metals concerned or precipitation by hydrogen sulfide of the sulfides of these metals, as follows:

By the use of hydrazine hydrate, phosphorus, stannous chloride, tannin, and other reducing agents, stable colloidal suspensions of several metals were pre-

pared in methyl alcohol and benzene. The concentration of salts used varied from 0.001 to 2 percent. A combination of phosphorus and hydrazine was necessary to reduce salts of copper, lead, tin, and antimony. Colloidal suspensions of metallic sulfides were prepared in the same dispersion media by passing dry hydrogen sulfide through dilute solutions of metallic salts. Protective colloids were generally found necessary for stability. Cellulose nitrate, in concentrations of 0.2 percent or more, successfully protected sols in alcohol, while rubber was found to be necessary for benzene. Some sulfide sols were very stable without protective colloids, but unprotected metal sols were short-lived.

Colloidal suspensions of metals and metallic sulfides in ether, dioxane, and acetone were prepared by reduction and by double decomposition reaction with hydrogen sulfide, respectively. As in the previous work on methyl alcohol and benzene, protective materials were necessary to insure stability. Cellulose nitrate was used with dioxane and acetone, while rubber was the best agent with ether. The suspensions were found to decrease in stability in the order alcohol, dioxane, benzene, ether, and acetone.

**The influence of sol concentration on flocculation values,** E. D. Fisher and C. H. Sorum. (Univ. Wis.). (*Jour. Phys. Chem., 44 (1940), No. 1, pp. 62–70*).—The applicability of the Burton-Bishop rule to hydrosols of chromium hydroxide, ferric oxide, arsensic trisulfide, manganese dioxide, stannic oxide, aluminum hydroxide, titanium oxide, and thorium hydroxide appeared to be a function of the purity of the sol. Highly purified sols followed the rule, but not sols containing relatively large amounts of stabilizing electrolyte.

**The use of chemical methods for the determination of available nutrients in Louisiana soils,** J. F. Reed and M. B. Sturgis (*Louisiana Sta. Bul. 313 (1939), pp. 28*).—The authors sampled A and B horizons of unbroken soils and soils of known cropping, yield, and treatment history, testing for available phosphate, potassium, and calcium by means of a commercial soil-testing set, for available phosphate, potassium, calcium, and magnesium by means of a more detailed laboratory method involving extraction with 0.05 N hydrochloric acid, and for these and other nutrients by other methods. Good agreements with field results were obtained from the use of the commercial testing set and by means of the laboratory method involving extraction with 0.05 N hydrochloric acid. Limits below which deficiencies of the various nutrients have been found were assigned. "Testing soils by chemical means should be of definite value in determining nutrient deficiencies and making recommendations for a particular farm or a particular field on a farm. The point has not been reached, however, where routine sampling, testing, and interpretation can be made by persons unfamiliar with the technics of the methods and the nature of the soils and crops."

**Oxidation of phosphorus to a pentavalent form by carbon dioxide,** P. H. Emmett and J. F. Shultz. (U. S. D. A.). (*Indus. and Engin. Chem., 31 (1939), No. 1, pp. 105–111, fig. 1*).—At from 800° to 1,200° C. a gaseous mixture of phophorus ($P_4$) and carbon dioxide containing more than 11.1 percent phosphorus vapor quickly reaches an equilibrium corresponding to the conversion of about 80 percent of the carbon dioxide to carbon monoxide. If less than 11.1 percent phosphorus is present, practically all elementary phosphorus is absent at equilibrium in this temperature range, a mixture of phosphorus pentoxide and phosphorus tetroxide being obtained. The equilibrium in the carbon monoxide-carbon dioxide-phosphorus pentoxide-phosphorus tetroxide system is such that with equal molal quantities of the pentoxide and tetroxide present the ratio of carbon monoxide to dioxide is about 1 : 2.

In the presence of phosphate rock the oxidation of phosphorus by carbon dioxide to the pentavalent form in the above temperature range is complete. The product formed is calcium metaphosphate.

**Activated carbon as a catalyst in certain oxidation-reduction reactions,** E. C. LARSEN and J. H. WALTON. (Univ. Wis.). (*Jour. Phys. Chem.*, *44* (*1940*), *No. 1, pp. 70–85, figs. 11*).—The activity of activated carbon was measured by its effect on the rate of decomposition of hydrogen peroxide and on the rate of autoxidation of stannous chloride and potassium urate. The effect of temperature of activation on the amount of iodine absorbed from aqueous solutions was determined.

The effect on the rate of decomposition of hydrogen peroxide when catalyzed by activated carbon was determined for the temperature of activation, source of carbon, initial peroxide concentration, variation of both quantity of catalyst and of peroxide, temperature of reaction, pH, metallic salts, and repeated use of the same catalyst.

The decay in activity of the carbon during peroxide decomposition is discussed from the point of view of surface oxides of carbon and the chain mechanism of peroxide decomposition.

**The use of zeolitic membrane electrodes,** C. E. MARSHALL. (Mo. Expt. Sta.). (*Jour. Phys. Chem.*, *43* (*1939*), *No. 9, pp. 1155–1164, fig. 1*).—The author points out that a membrane electrode may act in three ways: (1) As an uncharged film it may act merely to prevent convection at a normal liquid junction, (2) it may act as an ionic sieve, preventing either anions or cations from passing through, and (3) the restraint placed upon ionic movement may be only that which the membrane can exert by virtue of its electric charge. This effect may be superimposed upon the simple sieve action, and the cationic membranes used were found to have such an intermediate character. The equations involved in the theory of the behavior of such membranes are considered, and the experimental performance of membrane electrodes of chabasite and of apophyllite is reported upon.

The crystals or cleavage plates used were ground with fine abrasive on a glass plate to about 1 mm. thickness, examined microscopically for cracks, and when found free from this defect were further ground to a thickness of 0.5 mm. and cemented to the ground end of a glass tube. After from 3 to 10 days' soaking of the membrane in a suitable salt solution, a standard solution of the chloride of the cation to be studied was placed inside the tube, with a silver chloride electrode, the membrane dipping into a beaker containing the second solution and a saturated calomel electrode. The equilibrium potentials were then determined.

**A simple and efficient precipitate dryer,** A. LOWMAN. (Univ. Calif.). (*Science*, *90* (*1939*), *No. 2328, pp. 143, 144*).—The apparatus described was designed for drying protein precipitated by 70 percent of saturation with ammonium sulfate, such precipitates yielding dry mixtures containing more than half their total weight of ammonium sulfate when left to dry on filter paper. The apparatus used to lower the salt content of the dry product consisted essentially of a plaster of paris plate about ⅝ in. thick, fitted snugly into the top of a galvanized iron box over a 60- or 75-w. electric light bulb, holes drilled around the top and bottom of the box providing the necessary circulation of air. In using this device the author oven-dried the plaster plate, replaced it in the top of the box, and turned on the lamp for from 5 to 10 min. before placing the precipitate on the plate. The precipitate was prepared for drying by placing first on blotting paper. It was then spread thinly on the plaster plate, which absorbed the salt solution from the precipitate, the ammonium sulfate crystal-

lizing on the inside surface of the plaster because of the more rapid evaporation there brought about by the higher temperature at the inner than at the outer surface. Scraping free of precipitate and redrying prepared the plate for further use.

**Amino acids in the corn kernel**, F. A. CSONKA. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *59* (*1939*), *No. 10, pp. 765–768*).—The author finds that none of the indispensable amino acids considered herein are missing from the whole corn flour and that they are equally distributed in white and yellow corn. The amino acid composition of the whole corn kernel as found and as described in this paper when compared with that of casein shows that tryptophan and lysine are present at a lower level. The deficiency of tryptophan and lysine, which are absent in zein, apparently is not corrected sufficiently by the rest of the corn proteins. This conclusion, based on analytical findings, supports the general feeding practice of supplementation.

**Studies on wheat starch.—I, The amylopectin and amylose content of various wheat starches; II, The action of amylases on raw wheat starches; III, The action of amylases on wheat amylopectin and amylose**, O. E. STAMBERG and C. H. BAILEY. (Minn. Expt. Sta.). (*Cereal Chem., 16* (*1939*), *No. 3, pp. 309–319, figs. 2; pp. 319–330, figs. 5; pp. 330–335, figs. 2*).—The results of the first three studies of this series are reported upon in part as follows:

In the first paper electrophoretic fractionations of starches prepared from five varieties of wheat and of a commercially prepared wheat starch showed from 15 to 17 percent of amylopectin in each instance. Small and large wheat-starch granules separated from the same sample by a sedimentation process were found to contain about the same relative amounts of amylopectin as determined by the electrophoretic method. There was no significant difference in phosphorus content of the small and the large granules separated from the same samples of wheat starch. The amylopectin fraction separated by the electrophoretic method contained almost all of the phosphorus of the starch, and only a trace of phosphorus was found in the amylose.

In the second paper β-amylase hydrolyzed only about 1 percent of the raw wheat-starch granules. α-Amylase hydrolyzed raw wheat starches to a greater extent, about from 4 to 10 percent with the amounts of enzymes used, and differences in α-amylase susceptibility of the raw starches were noted. Durum starch was most readily hydrolyzed, followed by the commercial wheat starch, Thatcher 56, Thatcher 48, and Little Club, while Federation starch was most resistant to hydrolysis. α-Amylase hydrolyzed the small granules more readily than large granules in the raw state, but the differences were smaller than those observed for the various starch samples.

Raw wheat starches which had been finely pulverized by grinding for 84 hr. in a rod mill were easily hydrolyzed by both β- and α-amylase and with no significant degree of difference in the various starch samples. Such pulverized granules in the raw state were about as easily hydrolyzed as soluble starch paste. There was no correlation between the phosphorus content of the wheat starches and the enzyme susceptibility of the raw starches. It is suggested that the small differences exhibited by various types of raw wheat starches are due mainly to morphological differences of the granules. The rate of hydrolysis of the raw wheat-starch granules after successive increments of enzyme were added indicated that the same degree of resistance was present throughout the granule.

In the third paper amylose from wheat starch was much more easily hydrolyzed by both α- and β-amylases and combinations of them than the amylopectin fraction. Amylopectin was hydrolyzed by α-amylase more readily than by β-amylase. Amylose solutions which were allowed to retrograde for 2 days at 5° C. were

more resistant to hydrolysis by both the amylases and their combination than was the freshly prepared amylose. Amylopectin solutions showed very little change in enzyme susceptibility after a similar storage treatment. The decrease in enzyme susceptibility of the amylose solution was most rapid within the first 2 days of retrogradation at 5°.

**Absorption-mobility relationships in wheat-flour doughs,** P. P. Merritt and C. H. Bailey. (Minn. Expt. Sta.). (*Cereal Chem., 16 (1939), No. 3, pp. 377–383, fig. 1*).—The relationship between optimum absorption and mobility as measured with the farinograph at that absorption was determined on nine flours, three in each of the "weak," "medium strength," and "strong" classes. The mobility of a flour at optimum absorption was found to be characteristic of that particular flour and to vary widely between flours differing considerably in "strength."

**Extraction of hemicelluloses from plant materials: Quantitative study,** E. Yanovsky. (U. S. D. A.). (*Indus. and Engin. Chem., 31 (1939), No. 1, pp. 95–100, figs. 10*).—Extraction by both acid and alkaline solutions from beet pulp, rice hulls, and peanut shells was investigated. Normal extraction curves were obtained for rice hulls and peanut shells, but breaks in the curve in the extraction of beet pulp with both acid and alkali were noted. It is considered that this was probably due to the presence of pectin in beet pulp.

**Action of ketene on the pituitary lactogenic hormone,** C. H. Li, M. E. Simpson, and H. M. Evans. (Univ. Calif.). (*Science, 90 (1939), No. 2328, pp. 140, 141*).—The authors acetylated this hormone (amino nitrogen content, 0.53 percent) in 5 min. at room temperature by passing ketene, prepared by means of the generator noted below, through a suspension containing 10 mg. per cubic centimeter of the protein in an acetate buffer solution of pH 5.6.

**An improved type of ketene generator,** C. H. Li. (Univ. Calif.). (*Science, 90 (1939), No. 2328, p. 143, fig. 1*).—In the apparatus here described and illustrated acetone vapor from a round flask passes into the widened neck of a flask which contains a replaceable 15-mill tungsten filament kept at bright-red heat, and thence into a condenser arranged to reflux unchanged acetone vapor and ketene polymers to the flask. The vapors from the reflux then pass through a trap consisting of a cooling spiral and bulb immersed in ice and salt, and thence through a glass delivery tube fitted with a sintered glass distributing plate into the material to be acetylated. Glass connections are used throughout. It is noted that the rate at which the ketene is generated may be controlled by varying the current supplied to the heating filaments.

**A chemical reagent for thiamine,** H. J. Prebluda and E. V. McCollum (*Jour. Biol. Chem., 127 (1939), No. 2, pp. 495–503*).—The coupling of thiamin with various diazotized amines was studied for its possibilities in affording a means of separating the vitamin from extraneous material and of providing a basis for chemical estimation. Coupling could not be accomplished in an acid medium, but was successfully carried out when the diazotized amines were made alkaline and added to the thiamin. Diazotized naphthylamines and diazotized derivatives of aniline, coupled in alkaline solution with thiamin, produced a variety of red colors; the compounds obtained with *p*-aminoacetanilide and *p*-aminoacetophenone were purple red and insoluble in water, concentrated alkali, and dilute acids, but soluble in selective organic solvents, of which isobutyl alcohol, toluene, and xylene were found best.

Detailed directions are given for the preparation of the acetophenone reagent and its application in the test. This reagent, the most satisfactory of the ones tested, was found to give purple-red precipitates with natural and synthetic thiamin chloride and various substances and preparations containing this

vitamin. The reactivity of the reagent with numerous biologically important compounds was tested, inositol being the only one with which a colored precipitate (greenish-blue, turning yellow when washed with water) was formed. This, however, was soluble in dilute acid and could thus be removed from any thiamin precipitate.

Study of the behavior of the reagent with various pyrimidine and thiazole derivatives, some of them intermediates used in the synthesis of thiamin, indicated that the reagent is apparently specific for the 4-methyl-5-β-hydroxythiazole portion of the thiamin molecule.

Absorption spectra of purified samples of the colored precipitates prepared with the reagent from commercial samples of synthetic thiamin and of an adsorbate from rice polishings indicated maximum absorption at 325 mμ and in the visible region a maximum at 516 or 520 mμ. It is considered that many obstacles, such as complete quantitative extraction and concentration of thiamin from biological materials, must be overcome before the reagent is applicable in quantitative work.

**Chemical determination of vitamin $B_1$, I–III**, D. MELNICK and H. FIELD, JR. (*Jour. Biol. Chem., 127 (1939), No. 2, pp. 505–514, figs. 4; pp. 515–530, figs. 2; pp. 531–540*).—Three papers are presented.

I. *Reaction between thiamine in pure aqueous solution and diazotized p-aminoacetophenone.*—The reactivity of the Prebluda and McCollum reagent was tested with biologically inactive degradation products of thiamin and with various compounds, the results indicating the specificity of the reagent for thiamin.

The effects of varying the reaction time, the volumes of the solutions, and the pH were studied. Two parts by volume of the reagent to 1 of the thiamin chloride solution (containing 100 μg. per 10 cc.) were found to admit of maximum activity of the latter with minimum destruction by the alkali of the reagent, and to provide an excess of the reagent to care for other reactive substances from the biological material under test. For maximal and constant recoveries, it was found necessary to neutralize the vitamin to a point just alkaline to litmus and to follow this immediately with the addition of the reagent. For maximum color development a reaction period of at least 15 hr. was required before carrying out the xylene extraction. Under these controlled conditions and measuring the intensity of color of the xylene extract by microcolorimeter, results were found reproducible on solutions containing 5, 10, 20, 40, or 80 μg. of thiamin per cubic centimeter, the average deviation in 12 determinations being ±2 percent. Below 5 μg. this method was not sufficiently sensitive to give accurate results. Tests with solutions containing from 0.4 to 2.0 times the amount of thiamin in these various solutions used as standards indicated the necessity of standard reference curves in any practical application of the present method.

II. *Method for estimation of the thiamine content of biological materials with the diazotized p-aminoacetophenone reagent.*—This paper deals with the quantitative extraction of the vitamin from biological materials, its selective concentration by zeolite adsorption and subsequent elution, and a modification of the method noted above which permits of quantitative determination of the thiamin in the presence of substances formerly interfering with the reaction. The method developed was successfully applied to the determination of the thiamin concentration in extracts of rice polish, wheat germ, yeast, and liver.

Either water or 80 percent methanol in extraction periods of 30 and 10 min., respectively, in an atmosphere of nitrogen was a satisfactory solvent except for the liver, with which benzyl alcohol, a more selective solvent, was used. The vitamin was recovered from the alcohol extracts by acidulation and the addition

of an excess of ether, followed by distillation in vacuo to remove ether from the aqueous phase. The thiamin solution, free from organic solvents, was subjected to zeolite adsorption and subsequent elution with acidulated 25 percent KCl, both carried out in an atmosphere of nitrogen. These processes are noted in detail, the apparatus used being described and illustrated by diagram. Thiamin in the eluate was determined by the modified method, the modifications involving the use of an internal indicator (thymol blue) and the introduction of ethyl alcohol and phenol (95 percent alcohol solution containing 5 mg. of phenol per cubic centimeter used in a volume equal to that of the eluate). The latter reagents, according to preliminary experiments, increased the sensitivity of the reaction and the intensity of color in the xylene layer so that close agreement with theoretical values could be obtained even when the concentration of the test solutions varied from 0.4 to 5 times that of the standard. The phenol and alcohol also inhibited the interfering effect of other substances present (such as salts and any indicator). Although phenol reacted with the reagent to give colored compounds, these were not extracted in the xylene layer, which was selective for the red pigment due to the vitamin.

Steps necessary to obviate the interference of substances of biological origin and of permutite dissolved in the eluate are detailed. The results of recovery experiments are reported, the average recovery value being 101 percent, with an average deviation of ±3 percent. The method, as outlined, is specific for free thiamin. The vitamin in the phosphorylated form is not determined.

III. *Quantitative enzymic conversion of cocarboxylase (thiamine pyrophosphate) to the free vitamin.*—The present paper describes the quantitative enzymic conversion of thiamin pyrophosphate and monophosphate to the free vitamin, permitting the application of the method to the determination of the total thiamin content. A suspension of yeast powder permitted to undergo autolysis showed increased thiamin content; suspensions heated to 70° C. for 30 min. or ones containing added chloroform did not show this increase. These findings indicated that the change in thiamin values was due to enzymic hydrolysis. The yeast suspension, due to its enzyme activity, was capable of hydrolyzing quantitatively phosphorylated thiamin either in pure form or as present in yeast extracts. Optimal enzyme hydrolysis was found to occur at pH 4.5 and at a temperature approximating 45°; the enzyme activity was found to be associated with a water-soluble protein fraction of the yeast powder.

Incubation of extracts of yeast, rice polish, and wheat germ with an aqueous suspension of an active yeast powder for 24 hr. under optimal conditions resulted in quantitative conversion of all of the vitamin present into the free form permitting its chemical determination. The quantity of total vitamin determined in this fashion showed good agreement with values obtained by biological assay. By difference between thiamin values obtained before and after hydrolysis, the concentration of the phosphorylated vitamin could be estimated. From the results on the products tested, it appears that dried yeast may contain as much as 75 percent of its vitamin in the esterified form, while rice polish and wheat germ contain the major portion as the free vitamin.

**A quantitative biological assay of vitamin K**, S. ANSBACHER (*Jour. Nutr., 17 (1939), No. 4, pp. 303-315*).—A comparative study of various basal diets for vitamin K assays was made on 2,050 chicks. Data presented on the incidence of vitamin K symptoms resulting from feeding the various rations indicated that little, if any, vitamin K is present in one composed of ground polished rice 71 percent, ether-extracted fish meal 17.5, ether-extracted brewers' yeast 7.5, Osborne and Mendel salt mixture (with the addition of 0.04 percent copper sulfate and 5 percent manganese sulfate) 3, and cod-liver oil 1 percent. On this

diet severe vitamin K deficiency develops in all the animals within 15 days, and all chicks die within 4 weeks unless given a vitamin K supplement. As soon as the chicks on this ration show the hemorrhagic syndrome they are used for the assay, 5 chicks being employed for each concentration of the preparation under test. By the 6-hr. curative blood-clotting method developed, the vitamin concentrate in 0.10 cc. of cod-liver oil is introduced by pipette into the crop of the chick, the animal being allowed to remain in a cage for 6 hr. without food or water. A blood sample is then obtained by wing vein puncture and the clotting time determined. The unit of vitamin K is defined as the minimum amount necessary to render the blood clotting time of the vitamin K-deficient chick, weighing *70–100 gm., normal (<6 min.) within 6 hr. after administration.* The biological response resulting from the administration of unit amounts of a vitamin K preparation from alfalfa is reported. Biological data on a vitamin K standard *of Dam showed the Ansbacher unit, as defined, to be equal to 20 Dam units of* vitamin K.

**The isolation of vitamins $K_1$ and $K_2$**, R. W. McKee, S. B. Binkley, D. W. MacCorquodale, S. A. Thayer, and E. A. Doisy (*Jour. Amer. Chem. Soc., 61 (1939), No. 5, p. 1295*).—Observations are presented to indicate that the light yellow crystalline compound with vitamin K activity obtained from putrefied sardine meal is actually a vitamin and not an inactive compound upon which the vitamin is absorbed. This compound, designated as vitamin $K_2$, and Vitamin $K_1$, *the product isolated from alfalfa meal, are similar as to ultraviolet absorption* spectra, lability toward light, and chemical properties. Several preparations of $K_1$ all had a potency of about 100 units per milligram, while various prepara*tions of $K_2$ had potencies approximating 600 units per milligram. Analyses showed* the absence of nitrogen, sulfur, phosphorus, and halogens, and indicated for $K_1$ an empirical formula of $C_{32}H_{48}O_2$ or $C_{33}H_{50}O_2$ and for $K_2$, $C_{40}H_{54}O_2$ or $C_{40}H_{56}O_2$. Absorption maxima are reported for the two compounds, and it is noted that exposure to light produces radical changes in absorptive curves and loss of potency. Upon hydrogenation $K_1$ absorbed 8 atoms and $K_2$ 18 atoms of hydrogen, forming colorless compounds, which, upon exposure to air, oxidized to yellow products similar to the original vitamins.

**Derivatives of vitamins $K_1$ and $K_2$**, S. B. Binkley, D. W. MacCorquodale, L. C. Cheney, S. A. Thayer, R. W. McKee, and E. A. Doisy (*Jour. Amer. Chem. Soc., 61 (1939), No. 6, pp. 1612, 1613*).—The diacetates of dihydro vitamin $K_1$ and *dihydro vitamin $K_2$ were prepared as further evidence that these vitamins* possess the quinone structure suggested in the study noted above.

These $K_1$ and $K_2$ derivatives, prepared by reductive acetylation of the respective vitamins and purified by recrystallization from low boiling point petroleum ether or methanol, are described as colorless crystalline compounds melting at 59° C. and at 57°–58°, respectively. Results of elementary microanalyses indicated empirical formulas of $C_{36}H_{52}O_4$ or $C_{35}H_{54}O_4$ for the former and of $C_{44}H_{60}O_4$ or $C_{44}H_{62}O_4$ for the latter. The $H_2$ uptakes upon microhydrogenation amounted to 3.04 and 7.99 moles, respectively, as compared with 4.08 and 8.73 moles for the respective vitamins; the ultraviolet absorption spectra of the two derivatives were similar, with intense absorption at 230 mμ and 232 mμ respectively, where the extinction coefficient $E^{1\%}_{1\,cm.}=1{,}250$. Bio-assay indicated activities corresponding to 500 and 300 units per milligram. Working with vitamin $K_1$, it was found possible to repeat the reductive acetylation, obtaining derivatives identical with the original one and to convert the derivative by treatment with methyl *magnesium iodide to vitamin $K_1$. A correction is noted for the extinction coefficient* and the potency reported for vitamin $K_1$ in the above study. The potency as corrected is 1,000 units per milligram.

**Color reactions in vitamin K concentrates,** H. J. Almquist and A. A. Klose. (Univ. Calif.). (*Jour. Amer. Chem. Soc., 61 (1939), No. 6, pp. 1610, 1611*).—The color reaction described is effected by treating a methanol solution of the concentrate (a few milligrams in 1–2 cc.) with sodium methylate (1 cc. of the reagent prepared by dissolving 2–3 gm. of sodium in 50 cc. of methanol). Upon warming the mixture a distinct purple color slowly devolops if vitamin K is present and if interfering pigments are practically absent. The color soon changes to reddish purple and finally to reddish brown. At this stage carotenoid pigments may be removed by extraction with a hydrocarbon solvent, leaving the reddish-brown pigment in the methanol phase. This latter pigment is considered as the end stage of the color reaction described by Dam et al. (E. S. R., 82, p. 441). Assay findings and the relative color intensities determined are tabulated for various vitamin K concentrates (chromatographic adsorption fractions, incomplete molecular distillation fractions, and other preparations). The results, showing increasing depth of color to be associated with increasing vitamin K activity, strongly indicate that the color is due to the vitamin itself.

**The antihemorrhagic activity of certain naphthoquinones,** H. J. Almquist and A. A. Klose. (Univ. Calif.) (*Jour. Amer. Chem. Soc., 61 (1939), No. 7, pp. 1923, 1924*).—The color reaction of vitamin K concentrates with sodium methylate, as described above, is similar to that of phthiocol and similarly substituted naphthoquinones. It is also pointed out that ultraviolet absorption maxima, determined for vitamin K concentrates by Dam et. al. (E. S. R., 82, p. 441), are similar to maxima reported for phthiocol. Bio-assays of phthiocol, results of which are reported in the present study, show that it has antihemorrhagic activity greater than that of 2-hydroxy-1,4-naphthoquinone and less than that of 2-methyl-1,4-naphthoquinone. The methyl group appeared to be functionally important, whereas the OH group seemed to reduce the activity. The phthiocol exhibited approximately the same activity whether given in the diet or as a solution orally, intramuscularly, or intravenously. Lapachol and lomatiol, also tested, proved inactive even at a 100-mg. level.

**On the color reaction for vitamin K,** E. Fernholz, S. Ansbacher, and M. L. Moore (*Jour. Amer. Chem. Soc., 61 (1939), No. 6, pp. 1613, 1614*).—The evidence presented in this paper is interpreted to indicate that the color reaction described by Dam et al. (E. S. R., 82, p. 441) is not a criterion for the prescence of vitamin K.

In the experiments described a vitamin K concentrate, giving a strong color reaction with sodium ethylate and having a potency of 1 unit in 15γ, was found to be separated by chromatographic adsorption on slightly heat-activated calcium sulfate into two fractions. The one adsorbed on the calcium sulfate and removed by elution with ether gave an intense color reaction, but had no vitamin K activity at 15γ; the other fraction, an oil obtained from the yellow filtrate not adsorbed, did not give the typical color reaction with the ethylate (only a slight darkening instead), but was fully active in a dose of 8γ containing the entire potency of the original preparation. This yellow oil, purified by several chromatographic adsorptions and possessing a potency of 1,000 units per milligram, was unstable toward light, failed to give derivatives with reagents for keto or hydroxyl groups, and in spite of its high degree of unsaturation failed to react with maleic anhydride in boiling benzene. The slight color yielded with the sodium ethylate by the oil in the last steps of the isolation process was attributed to possible decomposition products of vitamin K.

**Simple compounds with vitamin K activity,** S. Ansbacher and E. Fernholz (*Jour. Amer. Chem. Soc., 61 (1939), No. 7, pp. 1924, 1925*).—Looking toward elucidating the nature of vitamin K and prompted by the announcement of

Almquist and Klose (E. S. R., 82, p. 662) that pure synthetic phthiocol possesses antihemorrhagic activity, observations are presented here on the activity of related compounds. 2-Methyl-1,4-naphthoquinone was found to be practically as active as vitamin K, but the diacetate of the corresponding hydroquinone was somewhat inferior in potency. Phthiocol prepared from the above compounds was found to have antihemorrhagic activity but to have a potency several hundred times less than that of vitamin K. Duroquinone was found to be inactive in doses as high as 1 mg.

**Quinones having vitamin K activity**, L. F. Fieser, D. M. Bowen, W. P. Campbell, M. Fieser, E. M. Fry, R. N. Jones, B. Riegel, C. E. Schweitzer, and P. G. Smith (*Jour. Amer. Chem. Soc., 61 (1939), No. 7, pp. 1925, 1926*).—Indications from recent published studies of other workers led the authors to postulate that vitamin $K_1$ is a 2,3-dialkyl-1,4-naphthoquinone. Specifically it is suggested that vitamin $K_1$ may be 2,6(?)-dimethyl-3-phytyl-1,4-naphthoquinone (or the 2-monomethyl compound) and vitamin $K_2$ 2,3-difarnesyl-1,4-naphthoquinone. These considerations suggested the testing of various quinones which were subjected to an exploratory assay (conducted by W. L. Sampson), employing the Ansbacher procedure noted on page 12 and using a dose level of 250γ. The findings are tabulated. Of the compounds tested, lomatiol and hydroxyhydrolapachol were found effective and 2,3-dimethyl-1,4-naphthoquinone very effective. These results suggested that some of the 2-hydroxy-3-alkyl-1,4-naphthoquinones possess vitamin K activity. The diacetate of diallyl-1,4-hydroquinone, also tested, was resistant to alkaline hydrolysis like the dihydro vitamin diacetates of Doisy et al. (noted on page 13). The absorption spectrum of the 2,3-dimethyl derivative showed maxima and extinction coefficients similar to those reported by Doisy and by Dam et al. (E. S. R., 82, p. 441).

**Synthesis of antihemorrhagic compounds**, L. F. Fieser, D. K. Bowen, W. P. Campbell, E. M. Fry, and M. D. Gates, Jr. (*Jour. Amer. Chem. Soc., 61 (1939), No. 7, pp. 1926, 1927*).—Results of bio-assays (by W. L. Sampson) of additional quinones are reported. Absorption maxima and extinction coefficients (determined by T. J. Webb) are reported for a number of these derivatives and for 2,3-dimethyl-1,4-naphthoquinone. For comparison, values reported by Doisy et al. and by Dam et al. for vitamins $K_1$ and $K_2$ are recorded.

Special significance is attached to the high activity of the 2,3-dimethyl-1,4-naphthoquinone in contrast to the much lower potency of the 2,6- and 2,7-isomers, to the greater potency of quinones of the naphthalene series in contrast to quinones of the benzene series and to the high potency of a 1,4-naphthoquinone having a β-unsaturated side-chain (allyl) in the quinonoid ring, as postulated for both vitamins. The spectroscopic data point to a close correspondence between the natural vitamins and 2,3-dimethyl-1,4-naphthoquinone. A number of examples are given to illustrate the methods developed for the synthesis of the quinones of the type considered favorable for vitamin K activity.

**On the constitution of vitamin $K_1$**, D. W. MacCorquodale, S. B. Binkley, S. A. Thayer, and E. A. Doisy (*Jour. Amer. Chem. Soc., 61 (1939), No. 7, pp. 1928, 1929*).—In further studies toward determining the structure of vitamin $K_1$ the diacetate of vitamin $K_1$ hydroquinone was subjected to ozonolysis. The resulting ketone gave a semicarbazone melting at 66°–67° [C.] and having the probable formula $C_{19}H_{39}ON_3$ as calculated from the results of elementary analysis. It is suggested that this semicarbazone may be identical with that of 2,6,10-trimethylpentadecanone-14 which has been reported as melting at 66°–67°. The formation of this ketone is taken to indicate the presence of a phytyl side-chain in the vitamin molecule.

Oxidation of vitamin $K_1$ with chromic acid formed oxidation products which could be separated into neutral and acidic fractions. The latter contained two

*distinct crystalline acids, one melting* at 191° being identified as phthalic acid; the second, forming yellow needles melting with decomposition at 210°, giving no color reaction with cyanoacetate and having a probable formula $C_{14}H_{12}O_4$ (calculated from the results of elementary analysis), is postulated as being 2-ethyl-1,4-naphthoquinone-3-acetic acid. On the basis of these degradation products it is considered that the structure of the vitamin $K_1$ molecule is 2-ethyl-3-phytyl-1,4-naphthoquinone.

**Vitamin K activity of some quinones,** S. A. Thayer, L. C. Cheney, S. B. Binkley, D. W. MacCorquodale, and E. A. Doisy (*Jour. Amer. Chem. Soc., 61 (1939), No. 7, p. 1932*).—A number of quinones of the anthracene, benzene, and naphthalene series were assayed for vitamin K potency. Quinones of the anthracene and benzene series were all found to be inactive. With the exception of 2-allyl-1,4-naphthoquinone, all of the derivatives of the 1,4-naphthoquinone series showed vitamin K activity. The 2-methyl derivative was the most active compound in this group, although its activity was relatively slight as compared with the natural vitamin $K_1$ (1,000 units per milligram) or $K_2$ (660 units per milligram). The diacetates of two of the dihydro-1,4-naphthoquinones showed activity and 2-allyl-4-amino-1-naphthol hydrochloride gave a positive reaction.

**Experimental work on lactic acid in preserving pickles and pickle products.—I, Rate of penetration of acetic and lactic acids in pickles; II, Preserving value of acetic and lactic acids in the presence of sucrose; III, Use of lactic acid in pickles and related products,** F. W. Fabian and C. K. Wadsworth. (Mich. Expt. Sta.). (*Food Res., 4 (1939), No. 5, pp. 499–509, figs. 5; pp. 511–519, 521–529; abs. in Michigan Sta. Quart. Bul., 22 (1940), No. 3, pp. 215, 216*).—In the first of these three papers it is shown that salt is *removed at a much faster rate during the first than during the second* 24-hr. freshening period. Approximately 50 percent of the salt was removed during the first hour after heating. A second heating was of little value in facilitating the removal of salt. Salt is removed from small pickles more rapidly than from medium-sized ones. Acetic acid penetrates pickles more rapidly than lactic acid. The rate of penetration of acid into the pickles is greatest during the first 24 hr. after they are placed in the acid liquor. In the case of small pickles from 75 to 80 percent of the total amount of acid absorbed by them is absorbed in the first 6 hr. after they are placed in the acid liquor. Equilibrium is reached within 40 hr. for small pickles, whereas medium-sized pickles require a longer time. Not only is the concentration of the acid important but also the ratio of weight of the pickles to weight of the acid present.

Paper 2 reports that when the acetic acid was kept constant and the concentration of sucrose was varied from 14° to 24° B. for each series of experiments, there was a gradual decrease in the number of jars of pickles showing viable yeasts as the percentage of acid was increased by increments of 0.2 percent for each series. However, there was no material decrease beyond 2 percent acetic acid. When the amount of sucrose was kept constant and the percentage of acetic acid varied, there was a gradual reduction in the number of jars showing viable yeasts. No significant reduction occurred, however, until a 22° had been reached. Under like conditions, increasing the lactic acid content by increments of 0.2 percent did not produce nearly so great a reduction in the number of jars showing the presence of viable yeasts as acetic acid did in the presence of the same sugar concentration, despite the fact that the lactic acid solutions had a lower pH value. Likewise, increasing the sugar concentration in the presence of lactic acid did not reduce the number of jars showing viable yeasts nearly so much as in the presence of acetic acid. In using a combination of acetic and lactic acids in the presence of varying amounts of

sucrose, the preserving action was proportional to the amount of acetic acid used. The preserving action was less than when acetic acid was used alone but greater than with lactic acid alone. The influence of increasing the concentration of sucrose on the viability of yeasts likewise was not so great in a combination of the two acids as with acetic acid alone but greater than with lactic acid alone. Under the conditions of these experiments, pH was not a reliable indicator of the preserving power of the acids present.

From the experiments recorded in paper 3, it is concluded that lactic acid was not suitable for making sour pickles either from the standpoint of flavor or keeping properties when used alone or in combination with acetic acid. Lactic acid was not suitable for making sweet pickles or relish when used alone, but greatly improved the flavor of these products when used in the proper ratios with acetic acid. The best ratios found were 1.6:0.4 or 1.8:0.2 percent of acetic and lactic acids, respectively. A combination of lactic and acetic acids gave better flavored processed dill pickles than did either acid alone. The ratio of acetic to lactic calculated as acetic which gave the best results was 1:0.2, 0.8:0.4, or even as high as 0.6:0.6 percent, respectively, with distilled vinegar.

**Experimental work on processing and finishing pickles.—II, The correct use of the salometer in pickle manufacture,** D. E. Richardson, F. W. Fabian, and C. K. Wadsworth. (Mich. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 19 (1939), No. 3, pp. 75–77, fig. 1; abs. in Michigan Sta. Quart. Bul., 22 (1940), No. 3, pp. 219, 220*).—Further work in this series (E. S. R., 82, p. 16) has shown that the salometer reading is accurate as an index of salt content only in high salt concentrations such as are found in salt stock or similar strong brines. It is desirable to determine the salt content of weaker brines such as used in genuine and process dills, and in freshening and processing waters by titration with silver nitrate and to convert it to the true salinometer value by a conversion curve. A correction must be applied for the density of volumetrically measured samples. This may be most conveniently applied by incorporating it in the conversion curve. The correction may be neglected in samples testing less than 3 percent salt. Sufficiently accurate results in determining the salt content of sweet liquors may be obtained by neglecting the conversion correction and taking the percentage of salt as determined by titration. The accuracy and simplicity of the method outlined recommends it for use in plant practice.

**Protein plastics from soybean products,** G. H. Brother and L. L. McKinney. (U. S. D. A.). (*Indus. and Engin. Chem., 31 (1939), No. 1, pp. 84–87, fig. 1*).—Seventy commercially available plasticizers were tried with formaldehyde-hardened soybean protein. The polyfunctional alcohols gave positive results as plasticizing agents; of these ethlyene glycol was best. The primary monohydric alcohols, esters, ketones, and oils gave negative results. Ethylene glycol improved the plastic flow of the material, apparently as a plasticizer. This material may be rendered thermosetting by heat. Ethylene glycol increased the water absorption from 10 to 21 percent. Oleanolic acid and aluminum stearates, in mixture with ethylene glycol, reduced water absorption more than other agents tried.

## AGRICULTURAL METEOROLOGY

**Recent developments in meteorological research,** C. F. Sarle. (U. S. D. A.). (*Kans. Acad. Sci. Trans., 42 (1939), pp. 369–375*).—"The problem of increasing the accuracy and timeliness of forecasts of yield per acre of important

crops involves consideration (1) of the relationship of weather and plant observations to yield—crop-weather research, and (2) of the possibilities of longer-range weather forecasting than is practicable on the basis of our present understanding of meteorology. The immediate objective of our research program is to get the best trained scientists available in this country working intensively on this twofold program—meteorology and agrometeorology. It is the purpose to direct, insofar as possible, the most promising meteorological research into lines of development that could have a bearing on the general problems of short- and long-range weather forecasting. This emphasis on an understanding of the physical forces involved is an essential background for statistical studies of observed phenomena. In the long run it is expected that the combined approach of the physical and statistical methods will produce the best results in the development of practical methods of longer-range forecasting and will increase the accuracy of the shorter-period forecasts."

**A portable wind-direction recorder,** R. A. FULTON (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1940, ET-153, pp. 3+[3], figs. 5*).—The wind-direction recorder developed and here described and illustrated is said to be capable of registering at least eight points of the compass. It has been amply tested by continuous service over a 9-yr. period in different sections of the United States, and has proved very useful in studying beet leafhopper (*Eutettix tenellus*) dispersal. The action of the instrument depends on an offset-vane shaft revolving directly above a circular chart, with the center of rotation midway between the center and the margin of the recording chart.

**An improved electric hygrometer,** F. W. DUNMORE (*Jour. Res. Natl. Bur. Standards [U. S.], 23 (1939), No. 6, pp. 701–714, pls. 2, figs. 7*).—The psychrometer and hair hygrometer are common means of determining the moisture content of the air, but when humidity readings are to be made or recorded graphically, remote from the point of measurement, or where humidity must be determined rapidly or in confined spaces or at low temperatures, these methods are not deemed practical. This paper describes a type of electric hygrometer which better fulfills these requirements, covering improvements made on an earlier type previously described by the author (E. S. R., 80, p. 154).

**Improvement in radio-sounding balloons: A short cycle radiosonde,** J. PICCARD and H. LARSEN. (Univ. Minn.). (*Rev. Sci. Instruments, 10 (1939), No. 11, pp. 352–355, figs. 3*).—A new radiosonde is described which is said to transmit information every 4 sec. as to pressure, temperature, and relative humidity of the atmosphere.

**Polarization of diffused light, atmospheric radiation, and probable indications as to the tendency of weather conditions** [trans. title], E. MEDI (*Ricerca Sci. [Roma], 10 (1939), No. 9, pp. 790–797, figs. 4*).—From the results of simultaneous observations of the course of the state of polarization of light diffused from a region of the atmosphere and that of the energy radiated from the same region, there were indications that in many cases it may be possible to determine how far the atmosphere will remain in its present condition or undergo changes. For the study of polarization, a new method was devised and applied especially to this type of investigation.

**Relation of sunspot periodicity to precipitation, temperature, and crop yields in Alberta and Saskatchewan,** L. P. V. JOHNSON (*Canad. Jour. Res., 18 (1940), No. 3, Sect. C, pp. 79–91, figs. 4*).—"Coefficients of correlation (*r*) were calculated for sunspot data as related to annual precipitation and to temperature data from Edmonton, Calgary, Medicine Hat, Swift Current, Battleford, and Qu'Appelle, and as related to data on the yields of wheat, oats, and barley in Alberta and Saskatchewan. In all cases the correlation was negative,

but only in the cases of precipitation at Edmonton, Calgary, and Battleford were the values significant. Data giving significant values of *r* are given graphical treatment. It was concluded that while the sunspot cycle probably bears some causal relation to precipitation and perhaps also to temperature and indirectly to crop yields, it, nevertheless, does not provide a basis for long-range weather forecasting owing to the confusing effects of other weather-determining factors. The literature on sunspot periodicity in relation to terrestrial phenomena is reviewed briefly."

**The atmospheric condensation nuclei in their physical, meteorological, and bioclimatic significance** [trans. title], H. BURCKHARDT, H. FLOHN, E. FLACH, and L. SCHULZ (*Abhandl. Geb. Bäder- u. Klimaheilk., No. 3 (1939), pp. IV+126, figs. 23*).—This monograph, following an introductory section, takes up the physical significance; climatology, meteorology, and bioclimatics of the condensation nuclei; the results of studies of nuclei and dust in the mountains of west Sachsen (Saxony); and nucleus counts in the Harz Mountains. Four pages of literature references and an index are provided.

**The currents of the Pacific Ocean and their bearing on the climates of the coasts**, H. U. SVERDRUP. (Univ. Calif.). ((*Science, 91 (1940), No. 2360, pp. 273–282, figs. 6*).—In this general address reviewing the currents of the Pacific Ocean and then considering their influence on the climates of the borderlands, the author calls attention to the fact that the atmosphere and the ocean represent two delicate thermodynamic machines which are interdependent. A change in the performance of one of them leads to a change in the other, which then brings about a new reaction in the first, a balance or steady state never being attained. To understand the complex sequence of events and discriminate between changes in climate due directly to changes in atmospheric circulation and indirectly to changes in ocean currents, it would be necessary to acquire a better knowledge of both the ocean and the atmosphere and of the interaction between them, whereas at present it is possible only to state empirically how the climates of the coasts are influenced by the ocean currents. To predict what climatic changes may be expected to occur one must know how the enormous machines, represented by the atmosphere and the ocean, really work. Great advances have been made in the study of the atmosphere, largely due to the securing and interpreting of upper-air observations, but, in dealing with the ocean, progress has been slow because of the difficulties of obtaining data. These are added reasons for studying the ocean currents, and particularly those of the Pacific, which, at present, are less known than those of any other ocean.

**Unusual cold period hurt but did not kill fall grains, legumes** (*Miss. Farm Res.* [*Mississippi Sta.*], *3 (1940), No. 2, pp. 1, 2*).—A summary is presented of temperature conditions and cold weather damage in January 1940 for northern, central, and southern Mississippi, respectively. For oats and vetch the injury was not as severe as at first thought, but for shrubbery and flowering plants it was more so, and "it is possible that livestock not supplied with feed and housing suffered most of all." The last comparable "cold spell" in Mississippi is reported to have occurred about 40 yr. previously.

**Atmospheric moisture in relation to ecological problems**, C. W. THORNTHWAITE. (U. S. D. A.). (*Ecology, 21 (1940), No. 1, pp. 17–28, figs. 3*).—The author discusses the saturation deficit, relative humidity and other measures of atmospheric moisture, the evaporating power of the air, atmospheric moisture gradients, and precipitation effectiveness indexes, concluding that the problem of atmospheric moisture in relation to ecological problems is still far from solved. When ecologists acquire a basic understanding of the process of moisture transfer between land surfaces and their vegetation and the atmosphere, the inadequacy

of present measurements of atmospheric moisture and the futility of attempting to determine relationships between simple functions of atmospheric moisture and physiological functions of plants will become apparent. Though empirical indexes of precipitation effectiveness are useful, they have great limitations. The direct measurement of water emission from natural surfaces into the air is feasible, but before undertaking it on a large scale, more satisfactory instruments for measuring atmospheric moisture concentration in the air must be developed. It is only when measurements of evaporation and condensation from natural surfaces under different types of plant cover are available for a large number of locations that it will become possible to evaluate the moisture factor in plant distribution.

**An evaporation-index meter for use in irrigation practice,** J. D. Wilson (*Ohio Sta. Bimo. Bul. 202 (1940), pp. 3–6, fig. 1*).—Ohio is generally considered to have sufficient rainfall for fairly normal crop development, but the growing seasons are frequently subject to droughts of such length that irrigation equipment for supplemental watering of lawns, golf courses, vegetables such as potatoes and celery, small fruits, and even alfalfa is becoming increasingly common in the State. In most cases the time and amount of application are regulated chiefly by the relation between rainfall and evaporation. Since, for economical use, an application of water is scheduled to be made whenever the evaporation index (differential between rainfall and evaporation) reaches a given amount, it becomes necessary to have a record of each rainfall and an accumulative record of evaporation over any build-up period preliminary to the use of irrigation. For use in making these records an apparatus and its use are described and illustrated, consisting of a black atmometer with a funnel mounted beside it to catch any water that falls as rain and conduct it into the larger of two bottles, from which it is in turn lost to the atmosphere by evaporation from the atmometer. This atmometer, which takes account of the effect of radiation on evaporation, as well as the effects of all other factors, has been found to lose an average of 264 cc. of water (corrected value) for each inch of water lost by a standard U. S. D. A. Weather Bureau evaporation pan during the period from May 1 to September 30.

**Rainfall characteristics as related to soil erosion,** D. I. Blumenstock (*U. S. Dept. Agr., Tech. Bul. 698 (1939), pp. 44, figs. 14*).—The subject matter of this study is discussed under the following headings: Significance of the precipitation factor in soil erosion, the problem of analyzing precipitation data (contrasts between local and general storms and interpreting individual station records), areas and stations selected for study, types of analyses undertaken, data utilized and methods of compilation, analysis of monthly and annual rainfall amounts, rainfall intensity factor, rainfall duration, length of periods without precipitation, diurnal variations in rainfall amounts, regional rainfall characteristics and their relation to soil erosion (Virginia-West Virginia area, south central prairie region, and southern Great Plains region), and extension of the present mode of inquiry to include other areas. These are 12 literature references, and an appendix presents data in 11 tables.

**The frequency and seasonal distribution of erosive rains in Ohio,** H. L. Borst, R. Woodburn, and L. D. Baver. (Coop. U. S. D. A.). (*Ohio Sta. Bimo. Bul. 202 (1940), pp. 15–21, figs. 2*).—In a study (1934–37) of ± 400 rains at the Northwest Appalachian Soil and Water Conservation Experiment Station at Zanesville, they were classified by the amount of erosion produced on a bare spot, the detailed analysis including only those (90) producing a soil loss of ⅒ ton or more per acre. Rains causing 1 ton or less per acre of soil loss were relatively unimportant. About 6 rains per year (31 percent of the rainfall)

caused 72 percent of the soil loss. Rains varied in intensity throughout the year, and their intensity materially influenced the soil losses. The high-intensity rains fell during summer, and more than three-fourths of the 4-yr. loss occurred from May to August, inclusive. An interrelationship of the amount and intensity of rainfall with soil loss was indicated. Soil losses may increase with either amount or intensity, and serious erosion was produced by storms high in both intensity and amount. Since a comparatively small number of rains each year caused a large proportion of the soil loss, the trends indicated by this study may be more definitely established with a longer period of record.

**Hydrologic studies: Compilation of rainfall and run-off from the watersheds of the Upper Mississippi Valley Conservation Experiment Station, La Crosse, Wisconsin, 1932–38,** O. E. HAYS and H. B. ATKINSON (*U. S. Dept. Agr., Soil Conserv. Serv., 1939, SCS–TP–29, pp.* [*4*]+*19*+[*123*], *figs. 75*).—This report records rainfall, run-off, and erosion losses on an unterraced pasture watershed on which experimental work was begun in 1932, on an unterraced cultivated watershed for which records have also been taken since 1932, and on a controlled watershed on which work was started in 1937. The data here assembled show in detail the effects of weather conditions, of the nature and slope of the land, and of land use upon surface run-off and soil losses. Standard and recording rain gages, measuring flumes (2-ft. Parshall flumes on the two unterraced watersheds and a trapezoidal flume on the control watershed), water-stage recorders, and silt samplers (Ramser on the unterraced and Geib on the controlled watersheds) were used in obtaining the data recorded. The locations of the instruments are shown in a map of the station site, and the methods of measurement are detailed.

**Water resources of Colorado, App. 1.—Climatological data of Colorado, I** (*Denver: Colo. State Planning Comm., Water Conserv. Bd., and State Engin., 1939, app. 1, vol. 1, pp.* [*10*]+*VII*+*230*, [*pls. 7, figs. 76*]).—The Water Resources Survey has compiled basic data which are being used to prepare a master report on the water resources of Colorado. These data, too voluminous to be included in the master report, are published in the form of appendixes, of which this is the first. "This appendix consists of climatological data, the greater part of which were obtained from the office of the United States Weather Bureau at Denver. The stream discharge data included were determined from the original records of the State engineer and the U. S. Geological Survey. The evaporation and snow course data were taken from published and unpublished records of a number of agencies in addition to the Weather Bureau, including the Bureau of Plant Industry, the Bureau of Reclamation, the State engineer of New Mexico, the Colorado Agricultural Experiment Station, and others as enumerated in the text."

**The temperature climate of Sweden** [trans. title], A. ÅNGSTRÖM (*K. Lantbr. Akad. Tidskr., 78* (*1939*), *No. 6, pp. 481–499, figs. 9; Eng. abs., p. 498*).—A survey is given of the results of a computation of mean temperatures for Swedish stations (1901–30), made according to international recommendation. On this basis tables and curves are given, from which the normal temperature for various altitudes and latitudes in Sweden can be obtained, while the deviations from these normals within different regions are plotted on anomaly charts. In this manner an idea has been obtained of the local variations in maritime influences throughout Sweden. Local maritime and continental regions are defined, the former being generally characterized by positive anomalies in early winter and negative anomalies in early summer, and the latter regions by negative anomalies in early winter and positive ones in early summer. It is also shown that a rather marked rise in temperature has occurred for the winter months during the last

century, while the temperature of the summer months has remained almost unaltered. These changes are explained chiefly through changes in atmospheric circulation.

## SOILS—FERTILIZERS

**[Soil investigations of the Arkansas Station]** (*Arkansas Sta. Bul. 386 (1940), pp. 30–35*).—The report contains notes on soil erosion investigations, which have included work on rainfall intensities, crop rotation in soil conservation, and plowing as an aid in soil and water conservation, all by R. P. Bartholomew, D. G. Carter, W. C. Hurlburt, and L. C. Kapp; and on nutrient availability and repeated application of fertilizers, productivity of Ruston fine sandy loam, a Coastal Plain soil, and outlying fertilizer experiments with Coastal Plain soils, all by O. R. Younge.

**[Soil investigations of the Delaware Station]** (*Delaware Sta. Bul. 220 (1939), pp. 13, 20, 21, 35–37*).—Work on boron treatment and crop growth is reported by H. C. Harris; the penetration and availability of metaphosphates in soils, by G. M. Gilligan; and factors that influence nitrogen fixation from cyanamide and dried blood in soils, by T. F. Manus.

**[Soil investigations of the Iowa Station]** (*Iowa Sta. Rpt. 1939, pt. 2, pp. 14–18, fig. 1*).—This report notes work on plant-food content and lime requirements of Iowa soils and the composition of various crops, by W. H. Pierre, R. W. Pearson, and A. J. Englehorn; soil erosion on the Marshall silt loam in Page County, Iowa, by Pierre, G. B. MacDonald, J. B. Davidson, and H. D. Hughes; and the character, fertilization, and management of high-lime and alkali soils of Iowa, by Pierre and J. L. Boatman.

**Chemical composition of the soils of Cass, Dickens, Falls, Hardeman, Polk, Scurry, and Wheeler Counties,** G. S. Fraps and J. F. Fudge (*Texas Sta. Bul. 581 (1940), pp. 73*).—It was found that bottom land or alluvial soils are better supplied with plant food than the upland soils of the same county. Many of the soils are deficient in phosphoric acid and nitrogen. Most of the soils are fairly well supplied with potassium, although some are low in this constituent. A few are low in lime and may have a tendency to become acid, but most are fairly well supplied with lime, while some are calcareous soils and high in lime. Pot experiments on most of the soils showed that under favorable conditions in the greenhouse most of the soils responded to the application of fertilizers containing nitrogen and phosphoric acid, but that few soils responded to the application of potassium salts.

**Summary of recent investigations on Brazilian soils,** A. Barreto (*Soil Sci., 48 (1939), No. 4, pp. 317–321*).—The author found it to be difficult to predict the fertility of lateritic soils on the basis of ordinary types of laboratory study, their base-exchange capacity being usually very low (0–1 milligram equivalent per 100 gm.), while there apeared to be no direct relation between base-exchange capacity of these soils and fertility. "The total acid property of these soils, however, is related to fertility. An attempt has been made, therefore, to find a measure of their total acid property, which should include replaceable H ions, free acids, surface absorptive power, and amphoteric compounds. The best results were obtained by titrating a given amount of soil with alcoholic 0.1 N NaOH," which could be done quickly and easily by vigorously shaking 5 gm. of air-dried soil with 50–100 cc. of alcoholic 0.1 N NaOH in a small stoppered flask. After settling from 5 to 10 min., an aliquot of the supernatant solution was drawn off with a pipette and titrated with 0.1 N HCl, bromothymol blue being used as indicator. The result, expressed as cubic centimeters of NaOH neutralized per 100 gm. of soil, is designated the "alcoxic index." It was found

that all the tropical lateritic soils studied gave alcoxic indices proportionate to their fertility, the more fertile ranging from 400 to 800.

The relation between alcoxic index, fertility, and Hissink's *S* value are thus illustrated: A horizon, alcoxic index 500 and *S* value 0.5; B horizon, alcoxic index 300 and *S* value 2; and C horizon, alcoxic index 150 and *S* value 6. Theoretical considerations involved in the titration reaction are discussed.

**A sampler for surface soils,** R. L. Cook and B. J. Birdsall (Mich. State Col.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 8, pp. 736, 737, figs. 2*).—In a tubular sampler of uniform bore the friction on the walls causes a compaction in the core which tends to push the core downward instead of cutting it cleanly and without disturbance. Furthermore it is difficult to remove the core from such a tube. This difficulty has been only partially overcome by cutting a slot in the side of the tube for a portion of the length, a design element which also weakens the tube. The sampler illustrated was made from a 1¾- by 8-in. steel shaft, drilled 1¼ in. through the center. The bore was increased to 1⁵⁄₁₆ in. from the top to within ½ in. of the bottom of the tube. The bore was then increased to 1¹¹⁄₃₂ in. for a distance of 4⅜ in. from the top of the tube. The outside walls were then turned down to 1¹⁷⁄₃₂ in. from its cutting end through a distance of 7 in., the top tapering outward to a diameter of 1¾ in. through the remaining 1 in. of its length. The cutting end is reduced to a cutting edge by a somewhat convex outside tapering extending back on the tube about ½ in. A ¼-in. hole drilled through the heavier top of the tube permits passing through a cross rod to serve as turning handle. Calibration marks for sampling depths of 4, 5, 6, 7, and 8 in. are placed upon the outside of the tube. A driving cap to protect the tube when it is hammered into very dry soils is also shown in the photograph of the complete assembly. The construction of the tube proper is shown in a dimensioned cross-section drawing.

**The laws of soil colloidal behavior.—XX, The neutral salt effect and the amphoteric points of soils,** S. Mattson and K. C. Hou (*Soil Sci., 44 (1937), No. 2, pp. 151–166, figs. 13*).—The study of the neutral salt effect, as expressed by the titration curves of soils, has been continued (E. S. R., 78, p. 162) and applied to Podzol and Rendzina. A theory regarding "the relationship in different soils between the point of intersection of the titration curves obtained in water and in neutral salt solutions (i. e., the point of exchange neutrality) and the point of complete net unsaturation (i. e., the equi-ionic point)" is advanced.

**The laws of soil colloidal behavior.—XXIA, XXIB, The amphoteric points, the pH, and the Donnan equilibrium,** S. Mattson and L. Wiklander (*Soil Sci., 49 (1940), No. 2, pp. 109–134, figs. 13; pp. 135–153, pl. 1, figs. 13*).—The present number of this serial contribution (noted above) appears in two parts. Part A, theoretical, sets forth the results of a study of the relationship of the mass law, as expressed in the form of the Donnan equilibrium, to the equi-ionic point and the point of exchange neutrality and to the effect of salts on the pH of soils. The equi-ionic point is defined as that pH of a salt solution which is not affected by the addition of the completely unsaturated soil (free acid-base ampholytoid). It represents the pH at which the capacities of the soil to combine with the anions and the cations of the solution are equal. The pH of exchange neutrality is that point at which the addition of a neutral salt to a soil suspension does not affect the pH of the latter. It represents the pH at which the increments, produced by the salt, in the capacities of the soil to combine with the anions and the cations of the solution are equal.

Of part B, experimental, the conclusions are thus stated: "The property of amphoteric soils simultaneously to exchange H and OH ions for the cations and anions of a neutral salt solution at, or near, the equi-ionic point of the

soil and the valence effect in the mass law (as expressed by the Donnan distribution of ions between the soil complex and the soil solution) lead to some very significant, but heretofore neglected, consequences. For the salts $Na_2SO_4$ and $CaCl_2$ the following expressions apply:

For acidoids: $$\frac{(H^+)_i}{(H^+)_o}=\frac{(Na^+)_i}{(Na^+)_o}=\frac{\sqrt{(Ca^{++})_i}}{\sqrt{(Ca^{++})_o}},$$

and for basoids: $$\frac{(OH^-)_i}{(OH^-)_o}=\frac{(Cl^-)_i}{(Cl^-)_o}=\frac{\sqrt{(SO_4^=)_i}}{\sqrt{(SO_4^=)_o}},$$

where the parenthesis represents activity and $i$ and $o$ signify that the ions are in the inside and the outside solutions respectively. The fact that the divalent ions enter the equation in the form of the square root of their activity indicates that, in low concentrations (in the 'outside' solution) of the salt and in the presence of equivalent proportions of free acidoids and basoids, the number of H ions displaced by the Ca ions will be greater than the number of OH ions displaced by the Cl ions, and the number of OH ions displaced by the $SO_4$ ions will be greater than the number of H ions displaced by the Na ions. In high concentrations the displacing power of the different ions will approach the same value. These conclusions are all drawn with the proviso that none of the ions enter into any specific reaction. From this it follows that, under the afore-mentioned conditions, $CaCl_2$ (or a salt of the type $M^{++}S^-_2$) must yield a maximum in exchange acidity in dilute solutions and $Na_2SO_4$ (or a salt of the type $M^+_2S^=$) must yield a maximum in exchange alkalinity in dilute solutions." These experimental results support the theoretical deductions of part A.

**The influence of exchangeable ions and neutral salts on the pH of soils,** M. Puffeles (*Jour. Amer. Soc. Agron., 31 (1939), No. 9, pp. 761–766*).—The pH value of a soil was found to be lowered on the addition of a neutral salt not only in humid soils but also in arid soils, most in heavy soils and least in light soils. In preparing Ca, Mg, K, and Na soils, it was observed that bivalent saturated soils, i. e., Ca and Mg soils, were less affected by the addition of neutral salts than the soils containing monovalent bases, i. e., K and Na soils. Also, Ca soil was less affected than Mg soil and K soil than Na soil. By examining the exchange of bases in the soil, the author finds it possible to obtain an accurate estimate of the extent to which the soil would be affected by the addition of a mineral fertilizer.

**Base exchange in soils.—II, Exchange acidity,** A. N. Puri and H. L. Uppal (*Soil Sci., 49 (1940), No. 2, pp. 155–162, figs. 2*).—Using the technic shown in the first paper of this series (E. S. R., 81, p. 341) to be more accurate than the usual procedure for estimating base-exchange capacity, the authors demonstrate, by an analysis of titration-curve data, that the production of free acid on the addition of a salt to an acid soil is governed by the law of distribution of a base between two acids of unequal strength.

**The effect of oxidation-reduction potential on plant growth,** N. J. Volk. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 8, pp. 665–670, figs. 4*).—The author studied the effect of oxidation-reduction potential on the growth, when oxygen was not a limiting factor, of 18 different crops tested in sand cultures provided with constant flow nutrient solutions of different Eh values but of constant nutrient value and in equilibrium with the air. No attempt was made to study changes in the state of oxidation or reduction or other changes that might accompany changes of Eh in soils. In all tests it is believed that Eh was the only variable present. The results show that for the plants tested a change in Eh from about 520 mv. to about 325 mv. did not affect

plant growth. An Eh of 325 mv. is approximately from 100 to 150 mv. below the lowest Eh reached by 48 arable Alabama soils tested throughout the year 1937.

**Heat conductivity as an index of soil moisture,** B. SHAW and L. D. BAVER. (Ohio State Univ.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 10, pp. 886–891, figs. 4*).—The authors placed two equiresistant coils of fine enameled copper wire, wound on 6-mm. glass tubing in two similar chambers drilled in a massive brass block, surrounded the coils with equal quantities of dry soil, and balanced a Wheatstone bridge of which the two coils were made to constitute two of the arms. They then replaced the dry soil in one of the chambers with moist soil having the same dry weight and noted the change in resistance of the coil in the moist soil chamber due to the more rapid conduction of heat to the walls of the block at an arbitrarily chosen time interval after turning on the current. The current, supplied by a 6-v. battery, was held constant at 0.4 a., and provided both the necessary heating of the two coils and also the means of determining the difference in their resistance increase. It was shown that heat conductivity thus measured gives a reliable index of moisture content, and that changes in the salt content of the soil solution do not materially affect the heat conductivity.

**An indirect method for determining the moisture content of soils at the "sticky point,"** F. CHAO-LIN (*Soil Sci., 48 (1939), No. 4, pp. 323–328*).—The author describes a method for locating the sticky point, which is based upon the fact that when drops of water are slowly added to a plane surface of fine soil, a nearly hemispherical mass is formed which, if picked up and kneaded by hand, just reaches the stage at which it no longer sticks to the hands or the knife. The soil is then assumed to be at its sticky point. Results obtained by this indirect method were comparable with those obtained by the method used by Keen and Coutts (E. S. R., 63, p. 510).

**The decomposition of organic matter in soils at different initial pH,** R. S. DYAL, F. B. SMITH, and R. V. ALLISON. (Univ. Fla.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 10, pp. 841–850, figs. 2*).—All the plant materials used (green crotalaria and green Natal grass harvested at two different stages of growth) decomposed more rapidly and more completely in soils at pH 5.94 to 7.05 than in those at pH 3.71 to 4.59. The detrimental effect of acidity on decomposition was more pronounced in soils treated with Natal grass than in soils treated with crotalaria. The acidity of the soils treated with crotalaria was decreased markedly in the soils of low pH at the beginning of the experiment. The addition of sufficient nitrogen as potassium nitrate to the Natal grass-treated soils to bring the total nitrogen content of these soils to that of the crotalaria-treated soils did not increase the rate of decomposition of the Natal grass. The plant materials containing the larger percentages of the hemicellulose, cellulose, and lignin fractions decomposed more slowly than those containing the smaller percentages of these constitutents.

"The decreased nitrification in the soils at pH 3.71, 4.26, and 4.59 was undoubtedly brought about by the micro-organisms utilizing the ammonia in the decomposition of the carbonaceous materials and also partly by the detrimental effect of the increased acidity on the nitrifying bacteria. A deficiency of available calcium in the strongly acid soils could possibly have caused this decreased nitrification observed in the soils at low pH."

**Forest soil studies.—I, Relation of rate of decomposition of tree leaves to their acid-base balance and other chemical properties,** W. M. BROADFOOT and W. H. PIERRE. (W. Va. Expt. Sta.). (*Soil Sci., 48 (1939), No. 4, pp. 329–348, figs. 3*).—Thirty-one representative samples of mature undecomposed leaves

and needles, representing 19 species, were studied, first with respect to differences in H-ion concentration, total nitrogen, water-soluble organic matter, ash, calcium, and excess base, and second in regard to their rates of decomposition as measured by loss of original material after periods of 2, 4, and 6 mo.

A marked difference in the rate of decomposition of fresh leaf litter from various forest-tree species, when maintained under controlled conditions and inoculated uniformly with a forest humus suspension, was observed. After the 6-mo. period the decomposition averaged less than 25 percent for samples of pitch pine, scrub pine, white pine, beech, and sycamore, whereas it averaged over 45 percent for samples of yellow poplar, staghorn sumac, black locust, and black walnut. This variation in rate of decomposition could be explained largely by variation in the chemical properties of the litter. The properties of the litter studied most closely associated with rate of decomposition were water-soluble organic matter, percentage of nitrogen, and excess-base content. During the first 2 mo. of decomposition the first two were the controlling factors, the multiple coefficient of correlation being 0.85, whereas during the 2- to 6-mo. period the dominant factor influencing rate of decomposition was the excess-base content of the litter, the simple coefficient of correlation being 0.77. The multiple coefficient of correlation between percentage decomposition during the 6-mo. period and the three independent variables—nitrogen, water-soluble organic matter, and excess base—was found to be 0.862.

**Chemical effects of saline irrigation water on soils,** W. P. Kelley, S. M. Brown, and G. F. Liebig, Jr. (Univ. Calif.). (*Soil Sci., 49 (1940), No. 2, pp. 95–107*).—The taking up of sodium by the exchange complex of the soil was found to be affected not only by the concentration of the sodium salt but also by the ratio of sodium to calcium. If this ratio is not greater than 2:1, very little Na will be absorbed, but as this ratio exceeds 2:1 the absorption of Na tends to increase proportionately. The kind of base held by the soil in replaceable form influences the absorption of Na. If the soil is Ca saturated, less Na will be absorbed from a given solution than if it is Mg saturated. If Mg constitutes a relatively high percentage of the total replaceable bases of the soil, relatively much Na will be absorbed. The Na of a solution of a given concentration, in which Ca is the only divalent base present, will be absorbed by a soil to less extent than if a substantial part of the divalent base is Mg.

"Despite the fact that very little Na is absorbed from saline solutions in which the ratio of Na : Ca is not greater than 2:1, it does not follow that the application of a comparatively dilute saline irrigation water containing Na and Ca+Mg in the ratio of 2:1 will have no deleterious effect on the soil. The reason . . . is twofold; first, the concentration of the salts in the soil moisture is sure to exceed that of the water applied; second, the ratio of Na to divalent bases in the resulting soil moisture is likely, because of the precipitation of Ca salts and the absorption of Ca by crops, to become considerably greater than that of the water applied. For these reasons it is suggested that the ratio of Na to Ca+Mg should not exceed about 1:1, but this conclusion should not be interpreted too rigorously because of the very great influence of total concentration and of different anions. With very dilute irrigation water it is probable that this ratio may safely be somewhat greater than 1:1."

**The influence of environmental factors upon the development of algae and other microorganisms in soil,** J. L. Stokes. (N. J. Expt. Stas.). (*Soil Sci., 49 (1940), No. 3, pp. 171–184, figs. 2*).—Except on the plat receiving stable manure, liming had a definitely beneficial effect upon the development of algae as well as upon that of bacteria and actinomycetes. The plats receiving stable manure and minerals had smaller algal populations than the plats which did

not receive any treatment or those that received minerals and nitrogen in the form of ammonium sulfate. No consistent differences could be found between the latter two treatments.

After periods of rain or snowfall the algal population of the plats increased, apparently as a result of more favorable moisture conditions. The soil moisture content had a decided effect on the growth of the algae. The optimum moisture range for the growth of algae was essentially the same as that for the bacteria and actinomycetes, namely, from 40 to 60 percent of the moisture-holding capacity of the soil. An excess of moisture was less detrimental to algal growth than was suboptimum moisture, both in surface and in subsurface soils. A high moisture content at the actual surface of the soil affected algal development more than did a similar moisture content below the surface, an observation attributed to the fact that at the surface the algae are able to utilize radiant energy, whereas they must live as heterotrophs below the surface.

As the pH of a soil was raised from 4.2 to 7.6 by the addition of $Ca(OH)_2$, a marked, gradual increase in algal growth on the surface was noted. In the subsoil, the effects of altering the pH were irregular. The numbers of bacteria and actinomycetes increased greatly with increase in the pH of the soil.

In the presence of light, the addition of organic matter inhibited, partially or completely, algal growth during the period of active decomposition of the organic matter by the bacteria and actinomycetes. The extent of the effects differed with the type of organic matter added. Inhibition appeared to be due to competition for essential elements, largely nitrogen and possibly others, which the bacteria and actinomycetes were able to utilize more rapidly than were the algae. It is suggested that other factors, such as unfavorable effects of specific organic substances, deficiencies of oxygen, and definite antagonisms, may also have played a part. After active microbial decomposition had slowed down and the bacteria and actinomycetes had begun to die off, extensive algal growth occurred. In the absence of light, even though various types of organic substances were present, algal development was restricted. Under these conditions, at least two limiting factors are considered to have been in operation: First, unfavorable competition for essential elements, at least in some cases, and, second, lack of an adequate food supply, since the added organic substances and products resulting from their decomposition could be utilized by the algae either not at all or only to a small degree. Even after the bacteria and actinomycetes had decreased in numbers, the algae failed to multiply extensively, a result attributed to a continued lack of available food.

**Survival of microorganisms inoculated into sterilized soil**, H. KATZNELSON. (N. J. Expt. Stas.). (*Soil Sci., 49 (1940), No. 3, pp. 211–217*).—Some typical soil fungi, bacteria, and actinomycetes were inoculated singly and in combination into steam-sterilized soil. All the organisms, with the exception of *Azotobacter chroococcum*, increased in numbers to a maximum and then gradually decreased. The number of *Azotobacter* decreased steadily.

The two organisms inhibited most consistently were *Actinomyces cellulosae* and *Bacillus megatherium* when combined with fungi, bacteria, or actinomycetes. In many instances *Azotobacter chroococcum* decreased in number more rapidly in association with other organisms than when alone.

Three plant pathogenic fungi, *Rhizoctonia solani*, *Helminthosporium sativum*, and *Fusarium culmorum* were able to develop in sterilized soil. The combination of *R. solani* and *H. sativum* with two bacteria (*B. cereus* and *Pseudomonas fluorescens*) or two actinomycetes (*Actinomyces cellulosae* and *A. fradii*) was unfavorable to the fungi. *F. culmorum* was not affected appreciably in combination with other fungi, bacteria, or actinomycetes. It is suggested that such

inhibition may play an important role in biological control of soil-borne plant parasites.

**The oxidation of manganous compounds by microorganisms in the soil,** G. W. LEEPER and R. J. SWABY (*Soil Sci., 49 (1940), No. 3, pp. 163–169, pl. 1*).—The microbial oxidation of manganous ions to manganic oxide was studied in soil-agar plaques adjusted to various pH values. Brown spots due to microbial oxidation were observed on plaques of which the final pH ranged from 4.8 to 8.9.

**Autolysis of a thermophilic Actinomyces,** H. KATZNELSON. (N. J. Expt. Stas.). (*Soil Sci., 49 (1940), No. 2, pp. 83–93, pls. 2*).—A thermophilic, autolytic *Actinomyces*, isolated from composting horse manure kept at 50° C., grew rapidly (24–36 hr.) and well on nutrient and starch-ammonium-sulfate agars but poorly on the Czapek, sodium-albuminate, and dextrose-asparagine agars. Autolysis occurred only on the starch agar after 24–48 hours' incubation at 50°.

The temperature optimum for growth and lysis was 50°. The most favorable reaction was pH 7.0–7.5, with limits of growth at pH 6.0 and 8.0. During its growth on the starch-agar medium, the organism reduced the pH from 7.0 to 5.7. The addition of $CaCO_3$ to the fluid medium prevented this drop in pH and inhibited autolysis. It was demonstrated that autolysis began before the pH of the medium had dropped below 6.0, and it was suggested that a combination of a certain pH (6.0–6.5) having been attained at a time when the organism was passing through a particular stage of its development was responsible for stimulating the autolytic mechanism.

**Bacteriological studies on a new capsulated bacillus, Bacillus krzemieniewski,** J. KLECZKOWSKA, A. G. NORMAN, and S. F. ŚNIESZKO (*Soil Sci., 49 (1940), No. 3, pp. 185–191, pl. 1*).—A new capsulated bacillus was isolated from cultivated soil. On solid media the colonies are large and raised, resembling hemispherical glass beads. The capsules are large and distinct, and stain slightly with most dyes. Media containing more than traces of organic or inorganic nitrogen are not favorable for capsule formation. As judged by the increase in viscosity of the medium, levulose and dextrose are the best carbon sources, lactose and maltose also being good. The differences in nitrogen obtained in inoculated and uninoculated media were not large enough to show that this organism fixes nitrogen.

**Experiments on the chemical nature and properties of the polysaccharide produced by Bacillus krzemieniewski n. sp.,** A. KLECZKOWSKI and P. WIERZCHOWSKI (*Soil Sci., 49 (1940), No. 3, pp. 193–195*).—The capsular substance formed by *B. krzemieniewski* was found to be a polymannose composed of *l*-mannose units. From its physical properties it may be assumed to have a high molecular weight.

**Assimilation of phosphorus by a mixed soil population and by pure cultures of soil fungi,** S. C. CHANG. (N. J. Expt. Stas.). (*Soil Sci., 49 (1940), No. 3, pp. 197–210, fig. 1*).—During the earlier stages of the decomposition of organic matter soil organisms were shown to convert inorganic phosphates into organic combinations, the extent of the transformation appearing to depend upon the supply of energy-yielding material and the supply of available phosphate.

There was greater synthesis as the quantities of available phosphate and energy-yielding material were increased. As long as the supply of these constituents lasted, the conversion of inorganic phosphate to organic phosphorus continued. "This explains why composts prepared by early workers from organic matter and insoluble phospate failed to show appreciable amounts of soluble phosphate. The materials in the composts were highly cellulosic in

nature, and the period of composting was not long enough for mineralization of much of the organic phosphorus." Continuous accumulation of organic phosphorus does not proceed indefinitely during the biological decomposition of organic matter. The course of changes is reversed upon exhaustion of the supply of energy-yielding material. Depletion of this material is attended by mineralization of the organic phosphorus, wherein the organic phosphorus compounds themeselves are transformed as source of energy. As long as the phosphorus requirement exceeds the amount derived by the micro-organisms from the organic compounds, synthesis exceeds mineralization. When these organic phosphorus compounds provide more phosphorus than is required for synthesis, the excess is liberated as inorganic phosphate.

The addition of soluble phosphate greatly stimlated the rate of decomposition of straw and cellulose. The speed of decomposition was increased by increasing the quantity of phosphate. "The role of micro-organisms in the conservation of phosphorus and in the supply of available phosphorus is of major importance and thus deserves consideration in studies of soil fertility, especially when organic manure is used."

**The adsorbed ions of colloidal clay as a factor in nitrogen fixation by Azotobacter,** T. M. McCalla. (Kans. State Col.). (*Soil Sci., 48 (1939), No. 4, pp. 281–286*).—Colloidal clay served successfully as a basic medium for the fixation of atmospheric nitrogen by *Azotobacter*. The amount of nitrogen fixed was influenced by the kind and quantity of ions adsorbed by the clay. The addition of colloidal material such as colloidal clay to an aqueous medium with minerals enhanced the ability of the *Azotobacter* to fix atmospheric nitrogen. In the Ashby medium the clay colloid was the most effective in increasing nitrogen fixation, bentonite and zeolite also gave a marked increase, but permutite greatly decreased and norite prevented the fixation. Suspended soil material did not serve as effectively as colloidal material with a base-exchange capacity.

**Effect of accelerated erosion on silting in Morena Reservoir, San Diego County, Calif.,** F. F. Barnes, C. J. Kraebel, and R. S. LaMotte (*U. S. Dept. Agr., Tech. Bul. 639 (1939), pp. 22, pls. 5, figs. 9*).—The Morena drainage basin, in the Laguna Mountains of southern California, is an important water-gathering area for the city of San Diego and is the site of a dam and reservoir completed in 1910. By 1935, 10.5 percent of the reservoir storage capacity had been displaced by sediment deposits, and large volumes of similar material had been deposited in the lower stream courses above the spillway level of the reservoir.

A study of the drainage area showed that most of the sediment had come from deep trenching of alluviated valleys (locally, "potreros") and from mountain slopes denuded of their protective cover by fire. Rapid trenching of the potreros began between 1890 and 1895, within 20 yr. after first occupancy (1875) of the basin by white settlers and the introduction of cattle. Cattle grazing has been maintained as the principal land use in the area. Overgrazing of the valleys and repeated burning of the brushy slopes for the production of sprout and weed forage have been the chief causes of accelerated erosion. Erosion is still accelerating, and, unless control measures are undertaken, the reservoir can be expected to receive sediment at a more rapid rate in the future than it has in the past. Control of erosion in the drainage area will require a coordinated program of engineering works, regulation or elimination of grazing, improved fire control, and possibly some planting. The most practical solution appears to lie in a cooperative plan of action by the ranch owners, the city of San Diego, and the Federal Government.

**The use of crop residues for soil and moisture conservation,** F. L. Duley and J. C. Russel. (U. S. D. A. and Nebr. Expt. Sta.). (*Jour. Amer. Soc.*

*Agron., 31 (1939), No. 8, pp. 703–709, figs. 2).*—Leaving crop residues on the surface of the ground appears, from the experimental results here recorded, to be a very effective and practical method of conserving soil and soil moisture in the Great Plains. Used in this way they may be expected to (1) increase greatly infiltration and thereby reduce the amount of run-off, (2) reduce evaporation from the surface soil, (3) reduce the amount of water erosion, and (4) reduce the amount of wind erosion. It is noted that the decayed part of the residue and any undecomposed material worked into the soil by whatever cultivation practice that may be used may aid in the maintenance of fertility, but in these tests it had little effect on the storage of soil moisture.

**Protecting field borders,** V. E. DAVISON (*U. S. Dept. Agr. Leaflet 188 (1939), pp. 8, figs. 6*).—Erosion of field borders is greatly accelerated by lack of cover and in many cases by the accumulation of water from the ends of furrows. The border can be made useful, and the woods kept from encroaching on the field, by the use of vegetation controlling erosion and converting the unsightly strip into a border of annual or perennial herbaceous plants for use as a turnrow. It can be made a good place to encourage some of the farm wildlife such as rabbits and quail and other familiar birds. This leaflet explains how farmers may protect their field borders and at the same time encourage an increase of desirable wild animals on the farm. A field border, properly prepared, should provide a strip on which woodland encroachment is prevented; a vegetated drain, where needed, to carry off excess water from the ends of furrows; a turnrow for work animals and equipment; and as much food, cover, and nesting protection as possible for wildlife.

**Plant food developments,** H. H. ZIMMERLEY. (Va. Truck Expt. Sta.). (*Amer. Fert., 92 (1940), No. 1, pp. 5–8, 22, 24*).—The author discusses some recent work on fertilizer placement, composition, potassium salts (chloride v. sulfate), reduction in number of fertilizer grades, rapid soil tests, and the trace-requirement elements.

**Effect of available phosphorus in southern soils upon crop yields,** C. DORMAN and R. COLEMAN. (Miss. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 8, pp. 671–677*).—Susquehanna fine sandy loam, a poor soil in the field, gave as high yields in the greenhouse as Ruston and Orangeburg fine sandy loams, 2 excellent agricultural soils. All of the soils studied in the greenhouse contained less than 6 p. p. m. available $P_2O_5$, and 11 of the 12 responded to the first phosphate applications, but none responded to heavier applications. Sagrain yielded as well on soils with 10 p. p. m. available $P_2O_5$ as on those with 40 p. p. m. Maximum yields were obtained on many soils with only 8 p. p. m. (16 lb. per acre) available $P_2O_5$. In field studies made with cotton on 10 different soils for 5 yr. those containing less than 6 p. p. m. available $P_2O_5$ gave excellent response, those containing from 6 to 15 p. p. m. gave some response, but those containing more than 15 p. p. m. gave very little or no response to phosphorus, although available $P_2O_5$ was greatly increased by the phosphate application.

**The fixation and release of applied potash on three Coastal Plain soils,** J. M. BLUME and E. R. PURVIS. (Va. Truck Expt. Sta. et al.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 10, pp. 857–868, fig. 1*).—Potassium was applied at the rates of 50, 100, 200, 400, 800, and 1,600 lb. of $K_2O$ per acre to an Elkton silt loam, a Portsmouth loamy fine sand, and a Sassafras sandy loam. Analyses for water-soluble, replaceable, and fixed potassium were made at monthly intervals over a 5 months' period on limed, unlimed, leached, and unleached soils kept under greenhouse conditions. The potassium fixed in all treatments varied greatly from month to month, an observation taken as indicating that the

*properties of a soil which affect fixation are dynamic in nature.* The possibility of microbiological fixation is suggested and supported by evidence of an inverse relationship between water-soluble and fixed potassium. Under controlled conditions, the amount of potassium held in the replaceable state remained constant over the 5 months' period in the Portsmouth and Elkton soils, while the fixed fraction varied greatly, the variation being shown in the water-soluble fraction. Monthly removal of the water-soluble potassium by leaching greatly reduced the replaceable and fixed fractions of potassium in all the soils studied.

**"Slick spots" in Nebraska,** J. W. Fitts, H. F. Rhoades, and E. S. Lyons. (Nebr. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 10, pp. 823–831*).—No consistent difference was found between the calcium carbonate content percentage of particles less than 0.005 mm. in slick spots and in normal soils. Most of the calcium carbonate was found in the separate less than 0.005 mm. The slick spots were consistently higher than the normal soils in percentage of saturation with sodium and potassium. The poor physical properties of the slick spots are attributed to the higher content of exchangeable sodium and potassium. A close relationship between the pH of the slick spots and normal soils and their respective percentages of exchangeable monovalent ions and calcium carbonate is shown.

**The chemical status of zinc in the soil with methods of analysis,** P. L. Hibbard (*Hilgardia [California Sta.], 13 (1940), No. 1, pp. 29, figs. 2*).—An adaptation of the "dithizone" method[1] was devised, the zinc and relatively small quantities of lead being determined together as zinc, with a necessary correction for the lead after its separate determination. For extracting the zinc from the soil upward percolation of the solvent through a layer of soil supported on sand which, in turn, rested upon a sintered glass plate was found most satisfactory. As solvents for the percolation, water saturated with carbon dioxide and a 0.5 N potassium chloride solution containing small concentrations of acetic acid were found best. Very little zinc was extracted by solvents not having a pH value lower than 7. Removing organic matter, either by burning or by hydrogen peroxide treatment, had no appreciable effect on the determinable zinc content.

"Probably much, if not all, of the easily soluble zinc in ordinary soils exists there mostly on the surfaces of particles either mineral or organic or both, held by surface attraction, instead of in true chemical combination. . . . Small amounts of zinc are almost everywhere present in soils; zinc is easily fixed in the water-insoluble state on mineral and on organic substance; zinc ores are easily decomposed by water; soil zinc is not easily replaced by the cations of neutral salt solutions."

**Inspection of commercial fertilizers for 1939,** T. O. Smith and H. A. Davis (*New Hampshire Sta. Bul. 317 (1939), pp. [1]+11*).—Of 109 brands of fertilizer analyzed in the 1939 fertilizer inspection 2 only were deficient in all 3 of the NPK elements, and the analysis of 66 brands equaled or exceeded the manufacturer's guaranty. Of 17 brands guaranteed with respect to magnesium oxide content all fully met their guaranties.

**Fertilizers for New Jersey** (*New Jersey Stas. Cir. 398 (1939), pp. [8]*).—Ten fertilizer grades are suggested for New Jersey use in 1940, each of these grades containing 20 percent or more total plant food. The basic ratios of the plant food elements in these fertilizers are indicated, and it is noted that "it would be well for farmers in ordering mixed fertilizers to think in terms of ratios as well as grades. The 1:2:2 ratio, for example, is represented both by 4–8–8 and 5–10–10. An application of 1,600 lb. of 5–10–10 is equivalent to 2,000 lb.

[1] Indus. and Engin. Chem., Analyt. Ed., 9 (1937), no. 3, pp. 127–131.

of 4-8-8 and has the advantage of being usually a little more economical." Specific recommendations are given for fruit crops, for field crops, for vegetables, and for home gardens, lawns, shrubs, and shade trees. The various factors upon which the effective use of commercial fertilizers is dependent are also outlined.

## AGRICULTURAL BOTANY

**German-English botanical terminology: An introduction to German and English terms used in botany, including plant physiology, ecology, genetics, and plant pathology,** H. and E. ASHBY, H. RICHTER, and J. BÄRNER (*London: Thomas Murby & Co., 1938, pp. XI+195, fig. 1*).—"This book takes the form of a brief survey of botanical science, given in English and German." The text deals with morphology, classification and phylogeny, cytology and genetics, physiology, ecology, and plant pathology. Appendixes deal with the names of common, wild, and cultivated plants, especially those occurring in Europe; a list of the most important common names of plant diseases; and abbreviations frequently used in German and in English botanical literature. English and German texts appear on opposite pages, and English and German indexes are provided.

**On the photography of experimental plants in the studio,** J. A. CARLILE (*Chron. Bot., 5 (1939), No. 4-6, pp. 445-447*).—Methods in successful use are described.

**Convenient seedling support for growing plants in water culture,** S. DUNN (*New Hampshire Sta. Sci. Contrib. 73 [1939], pp. 836, 837, fig. 1*).—Noted from another source (E. S. R., 82, p. 452).

**The use of a translongitome in making and interpreting alternate transverse and longitudinal serial sections,** D. M. CROOKS. (Univ. Ariz.). (*Science, 91 (1940), No. 2354, p. 150, figs. 5; also in Chron. Bot., 5 (1939), No. 4-6, pp. 440-442, figs. 4*).—An alternating, two-plane cutting attachment to be used in a rotary or sliding microtome has been developed by the author and is described and illustrated. Preparations by this method are said to be of great assistance in interpreting and determining the relationship of parts in original research and to be especially helpful for instruction in anatomy.

**Adaptation and origin in the plant world.—I, Factors and functions in coastal dunes,** E. V. MARTIN and F. E. CLEMENTS (*Carnegie Inst. Wash. Pub. 521 (1939), pp. VIII+107, pls. 5, figs. 32*).—The studies reported in this monograph were conducted at the transplant gardens on Pikes Peak and in a coastal garden at Santa Barbara, Calif., and a dune garden nearby. Instruments and transplants were maintained at both places throughout the growing seasons, and a large number of perennials have become permanently established to yield further results in adaptation. Results of the study are discussed relative to analyses of the climatic and soil factors of the dune habitat, measurements with sealed and free phytometers, transpiration rates of native species, the structural relations of leaves and root systems, and correlations, including the role of physical factors, growth and life forms, leaf structure and holard, stomatal frequency, significance of salt content, xerophytes of dune and desert, nature of xerophytes, and criteria of xerophytes. Over three pages of references are given.

**On the nature of light and temperature optima in carbon dioxide assimilation [trans. title],** M. G. STÅLFELT (*Svensk. Bot. Tidskr., 33 (1939), No. 4, pp. 383-417, figs. 9*).—Carbon assimilation in the lichen (*Usnea dasypoga*) was followed under constant external conditions in tests lasting several days. The optimum temperature and optimum light levels were determined under different com-

binations of light, temperature, and duration of assimilation. The temperature optimum for photosynthesis resulted from the interaction of a furthering and a retarding temperature effect and occurs in two different forms, the movable optimum and the optimum limit. The position of the former is determined by the duration of the temperature retardation. The longer the retardation lasts the lower the optimum temperature down to a point where it stays. At this optimum limit assimilation reaches the greatest speed uninfluenced by any retardation by temperature. The optimum limit for *U. dasypoga* is around 21° C. Consequently the movable optimum is restricted to higher temperature levels. In this respect the temperature optima agree with those of respiration and growth. In the case of actual assimilation (apparent assimilation plus respiration in the dark) the position of the movable optimum is determined by the intensity and duration of the temperature retardation, while the position of the optimum limit is independent of these and is also uninfluenced by the light intensity. Both forms of optima display temperature adaptations. With the apparent assimilation the same is true regarding temperature relations, but both optima are influenced in addition by light intensity, $CO_2$ concentration, and factors that alter the intensity of respiration.

Light also exerts a retarding effect on the processes of assimilation. The stronger the light the earlier the retardation starts, and, as it is in the nature of a time factor, the longer the test lasted the weaker became the assimilation. Thus a movable optimum arises whose position depends upon the duration of the experiment. The optimum moves away from the strongest light intensities toward the weakest. It was not determined whether the light had an optimum limit or not, but either there is no optimum limit or it lies in the lowest light intensities. The light and the temperature optima differ in that their optima limits occur at different distances from the minimal values of the factors. The maximal values of light and temperature vary on the same basis as the optimal values. With high light and temperature intensities and with long-continued photosynthesis, actual assimilation decreases more and more and gradually stops completely. Since respiration continues, however, the plants can give off $CO_2$ even in the light.

**Light and temperature retardation in carbon dioxide assimilation** [trans. title], M. G. Stålfelt (*Planta, Arch. Wiss. Bot., 30 (1939), No. 3, pp. 384–421, figs. 13*).—The daily course of photosynthesis was investigated under natural environal conditions for oats and under controlled constant environal conditions for two species of lichens. On cloudy days with moderate light intensity and moderate temperature the photosynthesis of the oat plant showed a daily course whose fluctuations can be interpreted as the results of the positive effects of light and temperature. On warmer and brighter days, however, the course of photosynthesis no longer followed the changes of light and temperature but mostly went in the opposite direction and could be interpreted only as retardations produced by light and temperature. In the tests with *Usnea dasypoga* and *Ramalina farinacea*, with external conditions held constant, intensity of photosynthesis proved first of all to be inconstant but for the most part dropped lower hour by hour. As it was not possible to determine whether this retardation was due to a temperature or a light effect, further studies were conducted in which light was held at different intensities from 4,000 to 48,000 lux and temperatures from 5° to 25° C. for 6 days with 10 hr. of light and 14 hr. of darkness per day. The results indicated that retardation by temperature first begins at the optimal temperatures (about 20° for the two lichens in the autumn), increases rapidly with the temperature, and is not reversed in the dark but acts as quickly in dark as in light. Evidence is presented that this

retardation by temperature is in the nature of an indirect effect. The retardation by light proved to be entirely reversible during the 14-hr. dark period. Its magnitude was proportional to the intensity of illumination and remained uninfluenced by the temperature. At optimal temperatures and higher the effect of retardation due to light was added to that due to temperature. The retardation of the assimilation by light was not an illusion produced by changes in respiration in the light. These light and temperature effects are considered as inactivation of the effective conditions or using up of the effective agents but not as the production of retarding substances brought about by photosynthesis. The retardation by light is concluded to be photochemical in nature.

**Chlorophyll as the prosthetic group of a protein in the green leaf, E. L. Smith** (*Science, 91 (1940), No. 2356, pp. 199, 200*).—The author presents further information on the nature of the chlorophyll of the leaf as a combination with protein (E. S. R., 80, p. 317).

**Studies on chloroplasts, I, II, A. C. Neish** (*Biochem. Jour., 33 (1939), No. 3, pp. 293–299, 300–308*).—Two papers are presented.

I. *Separation of chloroplasts, a study of factors affecting their flocculation and the calculation of the chloroplast content of leaf tissue from chemical analysis.*—The author describes a method said to enable chloroplast isolation at the rate of 2–3 gm. daily. The chloroplast substance in suspension was found to be charged, the charge depending on the pH and being negative above pH 3.7. Various cations caused flocculation of these suspensions, which could not be explained as simple electrical neutralization of charges. Evidently specific reactions may occur between the chloroplast substance and certain cations which are responsible for the anomalies noted, and the age of the chloroplast also may have some effect. Several methods for calculating the chloroplast content of leaf tissue, based on analysis for the plastid pigments, were developed and compared. The results obtained indicate that completeness of extraction of these pigments is affected by the presence of unknown substances. A simple method based on analysis for chlorophyll gave satisfactory results in most cases.

II. *Their chemical composition and the distribution of certain metabolites between the chloroplasts and the remainder of the leaf.*—Chloroplasts consist chiefly of proteins and lipins, containing a relatively high percentage of the latter as compared with the rest of the cell. Nearly all the lipin fraction could be extracted with 85 percent acetone. Cu, Fe, P, and $NH_4$ salts were found to be concentrated to a certain extent in the chloroplasts, while Ca, Mg, Mn, Na, K, and Cl showed an opposite localization in the cell and $SO_4$ and $NO_3$ did not follow any general rule. In the chloroplasts Cu appeared to exist chiefly in organic combination. Part of the Fe and P was also organically combined, but Ca and Mg were present mostly in inorganic forms. Most of the catalase in the leaf cells was found in the chloroplasts. Carbonic anhydrase and ascorbic acid occurred in appreciable amounts both in the chloroplasts and in other parts of the cells.

**Phosphorylation and respiration in barley, W. O. James and S. E. Arney** (*New Phytol., 38 (1939), No. 4, pp. 340–351, figs. 5*).—The respiration rate of barley seedlings germinating in darkness proved independent of the amount of phosphate supplied in the substrate, but the rate in embryos without endosperms was sometimes but not always increased by raising the phosphate supply. When sucrose was added to the medium the full dose of phosphate caused a 60-percent increase in the $CO_2$ output of the embryo. A high correlation was noted in 5-day-old seedlings between their phosphoric ester content and the rate of $CO_2$ emission, but the correlation disappeared with further

*carbohydrate starvation.* The phosphate ester content and $CO_2$ output of excised embryos decreased between the second and fourth days of germination. The phosphate increase in the substrate apparently caused a slight though not significant increase of esterified phosphate in excised embryos but not in complete seedlings. In seedlings without external phosphate supply there was a significant negative correlation between inorganic and esterified phosphate. It is concluded that phosphorylation is likely to occur during barley respiration, and a probable series of outline reactions is suggested.

**Notes on avocado anatomy,** P. Heismann (*Calif. Avocado Assoc. Yearbook, 1939, pp. 87–91, figs. 7*).

**The microscopic structure of plant cell membranes in relation to the micellar hypothesis,** W. K. Farr (*Jour. Phys. Chem., 42 (1938), No. 8, pp. 1113–1147, pls. 11*).—An address presenting an analytical review, with 40 references.

**Cellulose membranes from various parts of the plant kingdom,** F. L. Barrows (*Contrib. Boyce Thompson Inst., 11 (1939), No. 1, pt. 1, pp. 61–82, figs. 6*).—Cellulose is the form of ellipsoidal crystalline particles $\pm$ 1$\mu$ in size was identified in the cytoplasm and cell membranes of a number of plants belonging to the Thallophytes, Bryophytes, Pteridophytes, and Spermatophytes. These particles were especially numerous in young growing regions, where they were found in the cytoplasm as well as in various stages of orientation in outer regions of the protoplast. Mature membranes in which these individual structural units were no longer visible broke down on treatment with HCl (sp. gr. 1.19, at room temperature) to reveal their component cellulose particles. In all the cellulose membranes examined, the noncrystalline cementing material constitutes the continuous phase of the membranes and the cellulose particles the discontinuous phase. There are 40 references.

**Methylation of cotton fiber with ethereal diazomethane,** R. E. Reeves and H. J. Thompson (*Contrib. Boyce Thompson Inst., 11 (1939), No. 1, pt. 1, pp. 55–59, fig. 1*).—Repeated methylation of the mercerized fibers with ethereal diazomethane yielded products containing as much as 17.7 percent methoxyl. Native cotton fibers took up 9.8 percent methoxyl, considerably more than has been introduced previously by this method. Some of the properties of the methylated fiber are described. The moisture content of cotton fibers is said to have a direct influence on their reaction with diazomethane.

**Determination of turgor pressure in a single cell with the manometer** [trans. title], K. Arens (*Planta, Arch. Wiss. Bot., 30 (1939), No. 1, pp. 113–117, figs. 3*).—The apparatus and method are described and illustrated in detail. They have been used for measuring the turgor pressure of large cells, such as those found in *Nitella*, *Caulerpa*, and *Valonia*, and applicable, it is said, for both scientific and demonstration purposes and without injury to the cell, which may subsequently be used for other experiments. For class use, all that is necessary is to place a light behind the window of the apparatus and project the bending of the cell on a screen, while the pressure can be read on an illuminated manometer.

**Vernalization and the growth-phase concept,** H. H. McKinney. (U. S. D. A.). (*Bot. Rev., 6 (1940), No. 1, pp. 25–47*).—This analytical review (77 references) takes up the historical background; methods used; results with cereal plants (high- and low-temperature processes), forage plants, and miscellaneous plants; and morphological and physiological studies. In general, the chilling method was found to accelerate sexual reproduction with greater certainty than the high-temperature method in the particular species for which each method has been recommended. The majority of investigators outside of Russia have failed to recognize any great commercial value for these

methods as applied to small grains, rice, sorghum, forage crops, and cotton in the regions where these crops are grown, and it seems to be the general conclusion that the crop problems can best be solved through developing better adapted genotypes. Some commercial value is attached to the chilling method for forcing daffodils, Dutch and Spanish iris, and Easter lily. The general conclusions are discussed in detail.

**On the influence of various growth factors on the growth of green plants**, D. M. and J. BONNER (*Amer. Jour. Bot., 27 (1940), No. 1, pp. 38–42, figs. 3*).—Growth of *Cosmos* and mustard in sand culture was promoted by adding root or leaf growth factors or oestrone to the nutrient solution. The root growth factors, nicotinic acid and vitamin $B_6$, in addition to vitamin $B_1$, influenced particularly the growth of the root system, and their effects on the general vigor of the plant may in the main be secondary and attributable to the primary influence on the roots. The leaf growth factor, adenine, appeared to influence primarily the leaf size, but both adenine and another purine, uric acid, exerted marked effects on the general vegetative growth of the plants though these effects may be secondary to those on leaf growth. Confirming earlier work of others, additions of oestrone promoted growth.

**Control of bud growth and initiation of roots at the cut surface of potato tubers with growth-regulating substances**, J. D. GUTHRIE (*Contrib. Boyce Thompson Inst., 11 (1939), No. 1, pt. 1, pp. 29–53, figs. 4*).—Sprouting of nondormant potato tuber buds was inhibited by treating cut pieces with solutions of 250 mg. or more of the K salt of 3-indoleacetic acid per liter for 2 days or more at 10° C. When applied in concentrations of 20 mg. or more of the K salt for 1 day or more, α-naphthaleneacetic acid inhibited the sprouting of cut pieces of tubers, thus being more than 10 times as effective as indoleacetic acid. Pieces of tubers, the sprouting of which had been inhibited by the K salt of naphthaleneacetic acid, were made to sprout promptly by treating with ethylene chlorohydrin, but potassium thiocyanate had little effect. Sprouting of buds of whole tubers was inhibited by exposure to vapors of the methyl or ethyl esters of naphthaleneacetic acid. The volatility of the methyl ester at 10° was demonstrated by production of epinasty in tomato leaves. The buds of whole tubers, the sprouting of which had been inhibited by this vapor, were induced to sprout promptly by treating with the vapor of ethylene chlorohydrin. Exposure to the vapor of the methyl ester above noted also retarded the withering of whole tubers. Treatment with the vapor of acetonitrile induced considerable inhibition of sprouting in whole tubers.

Treating cut pieces of tubers with the K salt of indoleacetic acid (250–1,000 mg. per liter for 2 hr. at 10°) induced roots to grow at the cut surface in 11–24 days, roots being developed on pieces cut from the center of tubers without skin or eyes. Naphthaleneacetic acid induced rooting at the cut surface of tubers less promptly, but it was active in much lower concentrations. Indoleacetic acid induced rooting sooner and more completely in old or nondormant tubers than in freshly harvested or dormant ones. Breaking the dormancy of freshly harvested tubers with ethylene chlorohydrin caused them to root more readily when treated with indoleacetic acid. Treating freshly harvested tubers with the former increased the amount of auxin extracted from the tissue by a modified du Buy procedure, but had no effect on the amount extracted by the van Overbeek method. Indoleacetic acid failed to break the dormancy of freshly harvested tubers. It inhibited sprouting at high concentrations, but there was indication of a very slight stimulation at the low concentrations.

Considered as a whole, the results of these studies offer little support to the idea that the dormancy of potato tubers is regulated by increase or decrease in the amount of auxinlike substances in the tissues. There are 19 references.

***The effects of X-rays and radium upon regeneration of Bryophyllum calycinum***, E. NAYLOR. (Univ. Mo.). (*Amer. Jour. Bot., 27 (1940), No. 1, pp. 15–17, figs. 13*).—Regeneration from the leaves was retarded by X-rays, this effect increasing with length of exposure. None of the irradiation treatments showed any stimulation of regeneration, and no evidence of injury was noted in the treated leaves in which regeneration had been inhibited. The effects of radium were much like those of X-rays.

**Uncontrolled vegetative development in maize and teosinte**, R. G. REEVES and R. H. STANSEL. (Tex. Expt. Sta.). (*Amer. Jour. Bot., 27 (1940), No. 1, pp. 27–30, figs. 8*).—In several Texas localities a vegetative proliferation of the spikelets and of the plant in general was observed in corn. Study of such plants indicated that the envelopment of the ear by shucks during its development and its lateral position do not necessarily bring about fusion or loss of branches or the reduction of glumes. Another somewhat similar anomaly of teosinte is described, differing in several respects, however, from that found in corn. Recent literature contains suggestions that the relationship between corn and sorghum may be closer than generally recognized. The present study is regarded as still another suggestion of this relationship.

**The effect of alkali salts on plant growth**, J. L. DOUGHTY and A. E. STALWICK (*Sci. Agr., 20 (1940), No. 5, pp. 272–276*).—Six soils containing 0.157–1.096 percent of water-soluble salts (composition given) were used in this study of the effects of different concentrations of such salts on the growth of alfalfa, oats, and wheat. The extremes were spontaneously occurring soils from adjacent locations which were similar except for the salt contents. The intermediate concentrations were obtained by mixing different proportions of these two soils. The results indicated a gradual decrease in crop yields, with increased salt concentration. Under the conditions, 0.4-percent soluble salts was about the upper limit for fair crop growth. At 1.096 percent there was a reduction in yield of 33–77 percent. Alfalfa proved more resistant to high concentrations than either oats or wheat.

**The production and utilization of alcohol by plant tissues**, C. A. LUDWIG, F. E. ALLISON, S. R. HOOVER, and F. W. MINOR. (U. S. D. A.). (*Science, 91 (1940), No. 2355, pp. 170, 171*).—This is a preliminary note on studies on the metabolism of legume nodules and of legume and nonlegume roots applying to the general problem of the role of ethyl alcohol in plant respiration. The results are believed to favor the view that alcohol is an intermediate in normal plant respiration.

***The problem of Golgi material in plant cells***, L. J. NAHM (*Bot. Rev., 6 (1940), No. 2, pp. 49–72*).—A critical review of the methods used to demonstrate the Golgi apparatus in plants, the types found, and data on the chemistry and function of this material, with a tabulation of methods and results and 2½ pages of references.

***Deficiency symptoms of greenhouse flowering crops***, A. LAURIE and A. WAGNER (*Ohio Sta. Bul. 611 (1940), pp. [1]+26, figs. 20*).—Begonia, calceolaria, carnation, chrysanthemum, cineraria, fuchsia, gardenia, geranium, hydrangea, poinsettia, primula, rose, snapdragon, and sweet pea were grown in sand drip cultures, and the visual nutrient deficiency symptoms for N, P, K, B, Ca, Fe, Mg, Mn, and S were studied. The symptoms exhibited by these plants agreed in general with one another and with the symptoms noted by other investigators

on other crops. The symptoms, however, varied in degree or intensity with each plant studied, and there were some exceptions to the ordinary symptoms.

The general nutrient deficiency symptoms for the 9 elements studied are described. There are 45 references.

**Studies on the nutrition of fungi.—IV, Factors influencing the growth of some thiamin-requiring fungi,** L. H. LEONIAN and V. G. LILLY. (W. Va. Expt. Sta.). (*Amer. Jour. Bot.*, *27* (*1940*), *No. 1*, *pp. 18–26*).—Continuing these studies (E. S. R., 81, p. 523), the authors found a water-soluble substance present in agar and consisting of inorganic salts to cause as much as 100 percent increase in the yield of some fungi. The active substances for *Phycomyces blakesleeanus* were Zn and Fe, while other fungi had different requirements as to minor elements. Various organic acids rendered the less favorable N sources, such as arginine and $NH_4NO_3$, very readily available so that often as much as 1,000 percent or more increased growth was induced, while some organic acids were toxic. Small amounts of $NH_4NO_3$ added to aspartic acid increased growth over that induced by either the nitrate or the acid alone. The ratio and amount of dextrose and amino acids on the one hand and the amount of thiamin on the other exerted a very marked effect on growth. Other fungi used were *Phytophthora erythroseptica*, *Mucor ramannianus*, *Pythium ascophallon*, *Pythiomorpha gonapodioides*, and *Blakeslea trispora*.

**Effects of nitrogen compounds and trace elements on growth of Aspergillus niger,** R. A. STEINBERG. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *59* (*1939*), *No. 10*, *pp. 731–748*).—Growing *A. niger* in culture solutions led to further proof of the essentiality of Fe, Zn, Cu, Mn, and particularly Mo and Ga. Mo seemed to be specially important in reducing not only nitrates but also nitrites and nitrohydroxylaminic acid salt. A wide variation in trace-element content of different samples of reagent nitrates was found. Nitrates, $NH_4$ salts, and nitrohydroxylaminic acid salt were proved the best sources of inorganic N for growth, while nitrite, hyponitrite, hydrazine, azide, and nitrous oxide were useless and hydroxylamine was a poor source of N. The positive tests for nitrite in organisms are attributed to nitrohydroxylaminic acid. Its presence may also account for the hydroxylamine reported. Analogies were noted between the ability of inorganic N compounds to form $NH_3$ chemically, under the influence of acidity, and their assimilability, and substitutions of organic radicals in such compounds failed to improve their assimilability. Ammonia is concluded to be the primary source of N for conversion to organic N compounds. Specific starch reactions associated with Mn and Mo deficiency were repeatedly noted in the formation of post-growth metabolic products in culture. There are 14 references.

**Relation of carbon nutrition to trace-element and accessory requirements of Aspergillus niger,** R. A. STEINBERG. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *59* (*1939*), *No. 10*, *pp. 749–763*).—In studies of the requirements of cultures of *A. niger* (grown 4 days at 35° C.) in trace elements and carbon compounds, the results on trace-element needs with the sources of C used were poorer than those obtained with sucrose of exceptional purity. Fe, Zn, Cu, Mn, Mo, and Ga are apparently necessary whatever the C source. Scandium exhibited biological specificity when the fungus was grown on glycerol, the yield being doubled. Sucrose, *d*-glucose, *d*-fructose, *d*-mannose, and *l*-sorbose proved excellent sources of C and equally effective for nutrition, but glycerol, *d*-mannitol, *d*-lactose, and *d*-galactose were ineffective. Admixture of these C compounds, incapable of assimilation as sole C sources, markedly increased their assimilability, this increase on admixture being interpreted on the basis of mutual supplementation of compounds deficient in essential molecular configurations. Growth with glycerol and

mannitol also reached maximum when these compounds were supplemented with traces of sodium iron chlorophyllin and specific amino acids. The beneficial effects of traces of supplementary N compounds on C sources of low assimilability are attributed to the induction of special requirements for supplementation of deficiencies in molecular configuration. They are not considered due to the necessity for accessory growth factors, since the organism is fully capable of maximum growth with inorganic N and sucrose. Tests with yeast extract indicated that a supply of metabolites on a sucrose medium causes acceleration in growth, under otherwise optimum conditions, not attributable to accessory-factor requirements. These effects of organic N supplementation are believed due to limiting factors in the functional processes of the fungus and not to absence of the function.

**Influence of the size of the inoculum on the growth of Chlorella vulgaris in freshly prepared culture medium,** R. PRATT (*Amer. Jour. Bot.*, *27* (*1940*), *No. 1*, *pp. 52–56*, *figs. 7*).—In this study multiplication of the alga, when furnished a gas mixture of 5 percent $CO_2$ and 95 percent air in the nutrient solution in continuous light, is empirically described by the equation characterizing an autocatalyzed monomolecular reaction. Although this furnishes a reasonably true picture of the course of multiplication over most of the growth period, it was found to be inadequate in the earliest stages, and the discrepancy between calculated and actual values when the cell count was small increased with the dilution. The maximum population attained was independent of size of inoculum, but the multiplication rate throughout the growth period, indicated by the velocity constant, was greater for cultures at first containing small rather than larger numbers of cells. In a culture series of like age, the one with least dense population always had the highest growth rate. The multiplication rate, as measured by the increase in cell numbers per hour per 1,000 cells, decreased during nearly the entire growth period. The decrease in growth rate of old cultures was not due to depletion of nutrients. The evidence is believed to suggest that a growth-inhibitory factor was produced by the cells.

**Naming molds,** C. THOM. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, *30* (*1940*), *No. 2*, *pp. 49–64*).—In this address the author has "tried to picture . . . some of the problems of the 'applied mycologist' who works with the so-called 'common molds.'"

**Observations on certain film forming yeasts,** L. H. HOHL and W. V. CRUESS (*Zentbl. Bakt.* [*etc.*], *2. Abt.*, *101* (*1939*), *No. 1–3*, *pp. 65–78*, *figs. 5*).—From mixed cultures originating in Spain and France, the authors isolated 15 strains capable of film growth at certain stages of their development, of which 4 were nonfermentative and 11 fermentative types. Their morphology, fermentation characteristics with various sugars, alcohol production, alcohol tolerance of the film stage, $SO_2$ tolerance, the effects of temperature on them, their effect on alcohol, volatile acid and fixed acid of wines, and their aldehyde formation were studied, and the results are here reported. There are 35 references.

**Sexuality, developmental cycle, and phylogeny of yeasts,** A. GUILLIERMOND (*Bot. Rev.*, *6* (*1940*), *No. 1*, *pp. 1–24*).—This critical review (49 references), translated from the French by J. Dufrenoy, takes up the older notions, the sporiferous sac of yeasts considered as an ascus, conjugation prior to formation of the ascus, parthenogenesis, haplobiontic and diplobiontic yeasts, derivation of the haplobiontic yeasts from the Endomycetaceae, derivation of diplobiontic yeasts from the Exoascales, haplobiontic-diplobiontic hybrids, cytological features at conjugation among haplo-diplobiontic yeasts, and recent studies on the phylogeny of haplo- and diplobiontic yeasts. Present knowledge is said to indicate three types of yeasts, viz, the haplobiontic, diplobiontic, and the haplo-diplobiontic. If

is considered plausible that the yeasts as a group may have developed from forms similar to the Endomycetaceae. Some appear to have remained haplobiontic, like the Endomycetaceae, whereas others, evolving like the Exoascales to which they are related in the same way as to the Endomycetaceae, have become diplobiontic or at least tend to be so.

**Respiratory enzyme systems in symbiotic nitrogen fixation.—II, The respiration of Rhizobium from legume nodules and laboratory cultures,** D. W. Thorne and R. H. Burris. (Univ. Wis.). (*Jour. Bact., 39 (1940), No. 2, pp. 187–196*).—Continuing this series (E. S. R., 80, p. 21), a technic was developed for preparing suspensions of bacteria from legume root nodules and the respiratory activities of these Rhizobia freshly separated from nodules ("nodular" organisms) were compared with those of the same strains grown on laboratory media ("cultured" organisms). The maximum respiratory rate of a strain of *R. leguminosarum* from pea and vetch nodules and one of *R. japonicum* from soybean nodules was reached at a lower oxygen tension than that required for the same strains of cultured organisms, but the reverse was true with a cowpea strain. No distinct differences were noted between cultured and nodular organisms in their reactions to a number of inhibitors, including cyanide, ethyl urethane, iodoacetate, pyrophosphate, malonate, and maleate. Azide stimulated $O_2$ uptake of vetch and pea nodular preparations on glucose but inhibited the corresponding cultured strain. Fluoride greatly inhibited the respiration of cultured preparations of a cowpea strain with glucose as a substrate but strongly stimulated the corresponding nodular preparations. Although the results indicate some differences between the respiratory activities of cultured and nodular Rhizobia, their response to the various factors studied were, in general, quite similar.

**New varieties and new combinations in the genera Clausena, Oxanthera, and Triphasia of the orange subfamily, Aurantioideae,** W. T. Swingle. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 30 (1940), No. 2, pp. 79–83, figs. 2*).—A continuation of the taxonomic study of this orange subfamily previously noted (E. S. R., 80, p. 597).

**Eight new species of Pariana,** J. R. Swallen. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 30 (1940), No. 2, pp. 71–78, figs. 8*).—A taxonomic study of this anomalous genus of grasses inhabiting the tropical forests and forest borders from Panama to Brazil and Peru.

**Georgia Pyrenomycetes I,** J. H. Miller and G. E. Thompson. (Univ. Ga.). (*Mycologia, 32 (1940), No. 1, pp. 1–15, figs. 10*).—New taxonomy is presented under the genera *Guignardia, Sphaerognomonia, Gnomoniella, Mamiania, Ophiodothella,* and *Didymosphaeria,* and the new genus *Acrospermoides* is erected.

**Taxonomic relationships of Alcaligenes spp. to certain soil saprophytes and plant parasites,** H. J. Conn, G. E. Wolfe, and M. Ford. (N. Y. State Expt. Sta.). (*Jour. Bact., 39 (1940), No. 2, pp. 207–226, figs. 4*).—The name Rhizobiaceae was recently proposed by H. J. Conn[2] for the family containing *Rhizobium, Alcaligenes,* and *Chromobacterium,* together with certain species commonly included under *Phytomonas,* and this suggestion is followed in the fifth edition of Bergey's Manual of Determinative Bacteriology (E. S. R., 81, p. 489). Since the above noted paper was published only in abstract form, the data on the basis of which this suggestion was made are here presented in greater detail. It is considered that progress will be made in classifying these organisms largely by taking into account such points as the gram stain reaction, type of flagellation if any, and tendency to show true or false branching or irregularities in cell shape. Leaving out of consideration *Bacterium globiforme* and regarding the gram-positive rods as belonging with the branching forms

[2] Jour. Bact., 36 (1938), No. 3, pp. 320, 321.

often called *Mycobacterium*, there is left a fairly concrete group which can be considered as the family Rhizobiaceae. This is here defined, with *Rhizobium* as the type genus. Certain plant pathogens, notably those now designated as *P. rhizogenes* and *P. tumefaciens*, are deemed very closely related to species of *Rhizobium* and *Alcaligenes*, and there is believed to be little question but that they should be included in this family. Whether they should be put in a new genus by themselves or in one of those here noted is a matter for future study.

## GENETICS

**The genetics of pathogenic organisms**, edited by F. R. MOULTON (*Lancaster, Pa.: Science Press, 1940, pp. 90, figs. [14]*).—This is the third symposium in the biological field published by the American Association for the Advancement of Science. It was planned by experts in its field, and all contributions were invited by the Publication Committee, E. C. Stakman, Chairman. As published, it "constitutes a comprehensive, authoritative, and documented exposition of what has been learned and what needs to be further investigated in an important and relatively new field of science." The "Foreword" is by F. R. Moulton, and the following papers are included: The Need for Research on the Genetics of Pathogenic Organisms, by E. C. Stakman (Univ. Minn. and U. S. D. A.); Genetics of Viruses Pathogenic to Animals, by E. A. Watson; Genetics of Viruses Pathogenic to Plants, by L. O. Kunkel; Problems in the Variation of Pathogenic Bacteria, by G. B. Reed; Influence of Heredity and Environment on Pathogenicity in Bacteria, by H. Konst; Bacteria Pathogenic on Plants, by A. J. Riker (Univ. Wis.); The Genetics of the Parasitic Protozoa, by W. H. Taliaferro and C. G. Huff; The Influence of Host Constitution on the Parasite, by C. G. Huff; The Origin of Physiologic Races of Rust Fungi Through Hybridization, by J. H. Craigie; The Origin of Physiologic Races in the Smut Fungi by Hybridization, by H. A. Rodenhiser (U. S. D. A.); and The Origin of Parasitic Races of Phytopathogenic Fungi Through Mutation, by J. J. Christensen (Minn. Sta.). The symposium is summarized by E. C. Stakman.

**Linkage relations between smut resistance and semisterility in maize**, C. R. BURNHAM and J. L. CARTLEDGE. (W. Va. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 11, pp. 924–933, fig. 1*).—To determine segregation for smut reaction as relating to interchange points, crosses between susceptible chromosomal interchange lines and a resistant Lancaster Surecrop inbred line were backcrossed to a susceptible Leaming inbred. Highly significant deviations (odds of 99:1 or greater) from randomness were obtained and in the direction expected, with linkage between smut resistance and the following interchanges: 1–2*c*, 1–6*a*, 1–9*b*, 2–6*a*, 3–8*a*, and 6–8*a*. Less significant deviations (odds not less than 19:1) but in the same direction were obtained for 2–3*a*, 2–4*d*, 3–5*a*, 3–7*b*, 3–10*a*, 4–9*a*, and 9–10*a*. Among these interchanges, incomplete evidence indicated the locus of 1–2*c* in chromosome 2 to be one of the loci showing linkage with smut reaction. In all other cases, the break locus in either, or the loci in both chromosomes involved in the interchanges above listed may be associated with smut resistance. The method of procedure in the use of interchanges and inversions for this and other multiple factor problems is discussed.

**A genetic study of mature plant resistance in spring wheat to black stem rust, Puccinia graminis tritici, and reaction to black chaff, Bacterium translucens, var. undulosum**, C. L. PAN. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 2, pp. 107–115*).—In crosses of Marquis × H44, III–31–7, and Pentad × Marquis, III–34–1, with Minn. Double Cross, II–21–80, Hope, and H44, resistance to stem rust appeared to be dominant to semiresistance. The data indicated that Marquis × H44, III–31–7 carries a single

dominant gene which is allelomorphic to the one carried by Hope and H44, and that Minn. Double Cross. II–21–80 carries two complementary factors for semiresistance similar to those carried by Pentad × Marquis, III–34–1. Susceptibility to black chaff was apparently dominant to resistance. Resistance to stem rust was incompletely associated with subsceptibility to black chaff, but no single plant was found that was susceptible to both.

**The inheritance of intergeneric differences in Zea-Euchlaena hybrids,** D. G. LANGHAM. (Cornell Univ.). (*Genetics, 25 (1940), No. 1, pp. 88–107, figs. 11*).—Only characteristic differences were considered in this study of Zea-Euchlaena hybrids and their segregating populations. Weak response to length of day in corn (*Sd Sd*) was found dominant over the strong response in teosinte (*sd sd*) and segregated as a simple Mendelian character. Paired female spikelets of corn (*Pd Pd*) were dominant over single female spikelets of teosinte (*pd pd*) and showed simple inheritance. The many-ranked ear of corn (*Tr Tr*) was dominant over the two-ranked ear of teosinte (*tr tr*) and segregated as a unifactorial difference. Two-ranked ear was associated with two-ranked central branch of the tassel and many-ranked ear with many-ranked central branch. Mutation to the teosinte form for each of these characters occurred in corn. The gene *pd pd* (single spikelets) was linked with *tr tr* (two-ranked) with 20 percent recombination. The results were interpreted as supporting the theory of the origin of corn from teosinte by a relatively few large-scale mutations.

**The D Rs P linkage group in sorghum,** J. C. STEPHENS and J. R. QUINBY. (U. S. D. A. and Tex. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *59 (1939), No. 10, pp. 725–730*).—In the linkage group in sorghum described, the contrasting phenotypes are dry v. juicy stalks (*Dd*), red v. green seedling stem color (*Rsrs*), and purple v. brown plant color (*Pp*), respectively. Each of the factor pairs has shown complete dominance in $F_1$ and a 3:1 segregation in $F_2$. The indicated order of genes, with cross-over percentages, is *D* (10.9) *Rs* (16.4) *P*. Independent inheritance or cross-over values so high that linkage could not be demonstrated was found for two or three members of the linkage group with each of the following pairs: Presence v. absence of spreader (*Ss*), colored v. white seed (*Rr*), awnless v. awned lemmas (*Aa*), normal v. antherless flowers (*Alal*), normal v. male sterile flowers (*Msms*), and starchy v. waxy endosperms (*Wxwx*). See also a previous note (E. S. R., 80, p. 605).

**[Experiments in animal genetics and physiology of reproduction by the Wisconsin Station],** F. W. DUFFEE, H. D. BRUHN, W. WISNICKY, R. K. MEYER, L. E. CASIDA, S. H. BARKER, A. NALBANDOV, T. A. SCHNECKLOTH, A. B. CHAPMAN, T. D. BELL, A. E. DARLOW, G. BOHSTEDT, G. M. WERNER, I. W. RUPEL, G. E. DICKERSON, and L. C. FERGUSON (*Wisconsin Sta. Bul. 446 (1939), pp. 7–9, 12–19, fig. 1*).—Brief reports are given of the results in the application of the electrical method of ejaculation in foxes for artificial insemination; increasing the breeding and fertility of foxes by hormones; production of oestrus and stimulation of ovulation in cows classed as shy breeders or having cystic ovaries; assay of the pituitary glands of cattle for gonadotropic hormones; reducing the variability of assays for gonadotropic hormones by closer breeding of rats for experimental use; treating sterility in ewes with pregnant-mare serum, anterior-pituitary extracts, and Progynon-B; time of ovulation in cows; inbreeding, line-breeding, and outbreeding dairy cattle; relation of differences in production level to heredity and environment in dairy cattle; a description of identical twin calves; and another mutation to curly in rats.

**Physiological variation in horse as connected with age, breed, and performance,** V. I. PATRUSHEV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*

*23 (1939), No. 7, pp. 718–721)*.—Comparative physiological and biochemical investigations were made of English race horses, trotters, and draft horses. From the variations observed it was concluded that differences in the breathing, pulse rate, concentration of erythrocytes, and glutathione were hereditary constitutional differences related to the metabolism and spirit of the animal.

**Physiological variation within the English race-horses**, V. I. PATRUSHEV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 23 (1939), No. 7, pp. 710–713*).—Data are presented which show significant differences between the red cell complex, chemical composition, and glutathione present in the blood in different strains of English thoroughbreds which are correlated with the live weight.

**Hereditary differences in sires and environment responsible for the reliability of the average records of daughters**, W. E. ALTSCHULER (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 24 (1939), No. 4, pp. 364–367, fig. 1*).—Based on the production records of the daughters of 545 Simmenthal bulls used at about 800 collective farms, classification has been made to show that increased numbers of daughters reduced the variability in the transmitting qualities of the sires.

**On the results of fusion of the two dairy breeds Swedish Ayrshire and Red and White Swedish cattle** [trans. title], I. JOHANSSON (*K. Lantbr. Akad. Tidskr., 78 (1939), No. 5, pp. 401–448, figs. 11; Eng. abs., pp. 446, 447*).—Two breeds of cattle, the Swedish Ayrshire and the Red and White Swedish, were merged in 1928, and an analysis of the effect of the fusion showed that the most important bulls were more inbred than the average, which had from 3 to 3.6 percent of inbreeding in the two breeds. Crossbred cows between the original breeds were intermediate in size between the two breeds, but crossbred bulls attained about the same size as purebreds of the Red and White Swedish breed. Data on the milk and butterfat production showed that $F_1$ cows indicated some hybrid vigor in view of the fact that production exceeded that of either parent breed. It was also noted that the Swedish Ayrshires were lower in production during the last few years than was apparent earlier.

**Inheritance of black fibers in wool**, W. R. HORLACHER (*Arkansas Sta. Bul. 386 (1940), pp. 56, 57*).—Significant dam-progeny correlations were found between the black fibers in Hampshire fleeces when a sire with no black fibers was used, but little or no correlation was found when the sires had black fibers in their fleeces or were mixed, suggesting the importance of hereditary factors in determining black in the wool of sheep of this breed.

**A study of hybrid vigor in a cross between Poland China and Duroc Jersey swine**, E. ROBERTS and W. E. CARROLL. (Ill. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 11, pp. 847–854*).—Data are presented on the litters, weights, gains, feed consumption, and mortality of pigs produced by 105 Duroc-Jersey and Poland China sows mated at the same heat period with 2 boars of each of the two breeds. There were thus produced purebred and crossbred pigs, many of which were in the same litters. The results showed the crossbred pigs to be slightly but significantly superior in vigor and weights to the purebreds, especially when mixed litters containing both purebreds and crossbreds were considered. Litters from 1 boar in different matings averaged 7.78, as contrasted with 9.8 for mixed litters where both of 2 sires were involved. Marked differences in the boars and in the sows as regards size, mortality, and weights of the pigs were noted.

**Evidence of resistance to tumour grafts in the offspring of immunized rats**, S. RUSS and G. M. SCOTT (*Roy. Soc. [London], Proc., Ser. B, 128 (1939), No. 850, pp. 126–137, figs. 2*).—Data are reported from 4 experiments which

show that the size and survival of Jensen's sarcoma tumors in 385 rats was less in progeny from immunized strains. The number of tumors disappearing was 42 percent in the immunized strains as contrasted with 10 percent for the controls.

**Regional Research Poultry Laboratory**, J. R. MOHLER. (U. S. D. A.). (*Poultry Sci., 19 (1940), No. 2, pp. 106–108, fig. 1*).—A brief review is given of the objectives and progress made in breeding for disease control in poultry in the dedication of this laboratory.

**Crossing over and sex in the fowl**, D. C. WARREN. (Kans. Expt. Sta.). (*Amer. Nat., 74 (1940), No. 750, pp. 93–95*).—A tabulation of the crossing over between five pairs of genes in autosomes of the fowl, based on large numbers from several sources, suggested that any existing effects of sex on crossing over are so slight as to be negligible.

**Glutathione values of Cornish lethal and creeper embryos compared with normal sibs**, P. W. GREGORY, V. S. ASMUNDSON, H. GOSS, and W. LANDAUER. (Univ. Calif. and [Conn.] Storrs Expt. Sta.). (*Growth, 3 (1939), No. 2, pp. 75–88, figs. 3*).—The comparative weights and glutathione and ascorbic acid concentration of 14- to 19-day-old embryos from White Leghorn × Cornish lethal and creeper stocks were given. The results were tabulated against similar data for normal Barred Plymouth Rock and White Leghorn embryos. The normal and heterozygous lethal Cornish embryos showed similar growth records and glutathione concentration, but the lethals were consistently below the normals in body weight and glutathione. On the other hand, the heterozygotes and normals from creeper stock showed no significant differences in these respects.

**Heredity and avian lymphomatosis**, J. H. MARTIN. (U. S. D. A.). (*Poultry Sci., 19 (1940), No. 2, pp. 103–105*).—Essentially a review of the progress which has been made in breeding and inheritance of strains of poultry resistant to diseases. A discussion by K. B. De Ome (Univ. Calif.) of the paper is appended.

**Studies on gonad-hypophyseal relationship and cyclic osseous changes in the English sparrow, Passer domesticus L.**, A. KIRSCHBAUM, C. A. PFEIFFER, J. VAN HEUVERSWYN, and W. U. GARDNER (*Anat. Rec., 75 (1939), No. 2, pp. 249–263, pl. 1*).—Seasonal ovarian activity in sparrows was correlated with the formation of osseous spicules in the marrow cavity of the long bones, but the bone changes were not duplicated with injections of oestrogens. Juvenal testes grafted into ♀♀ and exposed to added light rays were stimulated to produce spermatozoa in winter. Evidently, the ovary secretes ♂ hormone, as indicated by the darkening of the bills of the ♀♀ during the normal breeding season.

**Spring development of the gonads of the starling (Sturnus v. vulgaris L.)**, W. S. BULLOUGH and R. CARRICK (*Nature [London], 144 (1939), No. 3635, pp. 33, 34, fig. 1*).—With reference to Rowan's paper (E. S. R., 80, p. 34), the authors call attention to differences in the rate and stage of sex development of British and continental strains of starlings in the early spring. Morphologically, the two types have not been separated.

**Efficiency of extraction and separation of certain AP hormones**, A. J. BERGMAN, O. B. HOUCHIN, and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology, 25 (1939), No. 4, pp. 547–553*).—Using largely methods of assay developed in the dairy husbandry laboratories, methods of extraction of sheep and cattle anterior pituitaries were developed which, in the main, separated the active hormones except that the mammogenic hormone was not recovered. Slightly less than 50 percent of the lactogenic hormone was present, and it contained only traces of the thyrotropic, gonadotropic, carbohydrate metabolism, and fat metabolism hormones.

**Progonadotropic sera of animals treated with hypophyseal extracts,** P. A. KATZMAN, N. J. WADE, and E. A. DOISY (*Endocrinology, 25 (1939), No. 4, pp. 554–567*).—The serum of sheep treated for as long as 262 days with sheep pituitary extract showed no antigonadotropic activity but enhanced the gonadotropic effect of serum separately injected into test rats. Serum from such animals did not augment the effects of extracts of the pituitaries from pigs or beef cattle or the urine of pregnant women. Administered alone, the extract had no effect on virgin ♀ rabbits or mature and immature ♀ rats. The results lend support to experiments showing that animals do not produce antigonadotropic substances to subjects from the same species. The active substances from serum could be stored by freezing, but activity could not usually be demonstrated after boiling and after standing in an acid solution.

**Biological studies of the gonadotropic principles in sheep pituitary substance,** H. M. EVANS, M. E. SIMPSON, S. TOLKSDORF, and H. JENSEN. (Univ. Calif.). (*Endocrinology, 25 (1939), No. 4, pp. 529–546*).—The two principles previously isolated from sheep pituitaries (E. S. R., 82, p. 323) were injected into normal and hypophysectomized immature ♀ rats. Synergistic, luteinizing, and antagonistic effects between the follicle- and interstitial-cell-stimulating extracts could be demonstrated. When given intraperitoneally, the interstitial-cell-stimulating fraction was found to inhibit follicular development induced by the follicle-stimulating fraction or pregnant-mare serum and was considered a separate substance from prolan.

***The effects of proteolytic enzymes on purified gonadotropic hormones,*** A. A. ABRAMOWITZ and F. L. HISAW (*Endocrinology, 25 (1939), No. 4, pp. 633–637, figs. 4*).—The gonadotropic effects exhibited by follicle-stimulating hormone, luteinizing hormone, and pregnancy urine were completely destroyed by incubation at 37° C. with crystalline trypsin. Crystalline chymotrypsin destroyed the effects from pregnancy urine completely but inactivated the others only in part. Somewhat similar results were obtained from papain and ptyalin.

**Action of estrone on sexual organs of immature male cats,** W. F. STARKEY and J. H. LEATHEM (*Anat. Rec., 75 (1939), No. 1, pp. 85–89, pl. 1*).—Injection of oestrone as Progynon-B for from 10 to 30 days into ♂ cats from 5 to 12 weeks of age was found to cause hypertrophy of the glandular epithelium of the prostate, as compared with the controls.

**Diethylstilbestrol compared to estrone in causing estrus in spayed mice and in conjunction with progestin in inducing sexual receptivity in spayed guinea pigs,** J. A. LEIGHTY and H. J. WICK (*Endocrinology, 25 (1939), No. 4, pp. 597–600*).—Comparison is reported of the doses of oestrone and stilbestrol administered orally, subcutaneously, and percutaneously required to induce oestrus in spayed mice. Sexual receptivity was induced in spayed guinea pigs by either oestrogen rubbed on the neck or given subcutaneously and followed by progestin administered subcutaneously.

**The effect of progesterone on the mouse ovary as influenced by gestation,** H. SELYE (*Anat. Rec., 75 (1939), No. 1, pp. 59–73, pls. 2*).—The ovarian weights of nonpregnant adult mice were found to be materially reduced by 5 days' administration of 1 mg. of progesterone. In contrast with normals, mature follicles and recent corpora lutea were invariably absent in the progesterone-treated group. Injection of progesterone in pregnant animals did not cause ovarian atrophy or interfere with normal delivery and the onset of normal lactation.

**The inhibition of the action of the follicle stimulating hormone by the pituitary,** H. L. FEVOLD and V. M. FISKE (*Endocrinology, 24 (1939), No. 6, pp. 823–828*).—The administration of oestrogen and luteinizing hormone for 8

days to immature rats prevented the ovarian reaction to the follicle-stimulating hormone. The inhibition was not produced in the hypophysectomized ♀♀ or when the ovaries were implanted in untreated animals.

**A comparison of the effects of male and female sex hormones on immature female rats,** F. W. Clausen and C. B. Freudenberger (*Endocrinology, 25 (1939), No. 4, pp. 585–592, figs. 8*).—Comparison is reported of the effects of theelin and testosterone injected separately and together on the different endocrine organs and body weights and measurements of immature ♀ rats. The combination produced the greatest change, and the androgen ranked second. Some antagonistic action was evidenced by changes in weights of the body, hypophysis, and adrenals.

**Experimental intersexuality: The paradoxical effects of estrogens on the sexual development of the female rat,** R. R. Greene, M. W. Burrill, and A. C. Ivy (*Anat. Rec., 74 (1939), No. 4, pp. 429–438, figs. 8*).—Report is made of histological studies of ♀ progeny from 21 of the pregnant ♀♀ treated with oestradiol in the study previously noted (E. S. R., 80, p. 35). There was stimulation of the uteri and nipples, with inhibition of the lower vagina and ovarian capsule. The development of the Wolffian duct was somewhat variable.

**Interactions of estrone and prolactin with special reference to the effect of estrone on the pigeon crop-gland response,** S. J. Folley (*Endocrinology, 24 (1939), No. 6, pp. 814–822, figs. 3*).—Studies of the stimulation of growth in the crop gland of pigeons as a result of prolactin treatment showed that oestrogen administration inhibited, to a varying extent, the response of the crop gland. With increasing doses of oestrone the inhibition increased, but the maximum inhibition remained constant at different levels of prolactin. It was also noted that prolactin tends to increase body weight, while oestrone tends to have the opposite effect.

**Sex difference in the response of the pigeon crop-gland to prolactin,** S. J. Folley (*Nature [London], 144 (1939), No. 3654, p. 834*).—Further study of the comparative weights of the crops of pigeons after treatment with prolactin showed that immature ♂♂ gave a significantly greater response than ♀♀.

**Response of pullets to androgens,** W. R. Breneman (*Poultry Sci., 19 (1940), No. 2, pp. 147–153*).—Continuing the study of the effect of the administration of androgens on comb growth of pullets, capons, and cockerels (E. S. R., 80, p. 181), the author noted that the response of cockerels given injections from hatching to the fourth day or from the fifth to the ninth day of age was generally greater than the reaction of pullets or capons. The pullets were not as sensitive to variations in the dosage as cockerels. There was a sharp decrease in the rate of comb growth of pullets after the twentieth day. This effect is taken as an example of an antagonistic effect of the androgens and oestrogens produced by pullets on comb growth. The comb growth of capons injected from the fifth to the ninth day with 100 International Units of theelin was significantly greater on the tenth and fifteenth days than that of the controls, demonstrating, with other data, that oestrogens can promote comb growth. The antagonism between the ♂ and ♀ hormones was further noticed in pullets injected with testosterone propionate and theelin at from 1 to 4 days after hatching.

**Action of testosterone propionate on the structure of the anterior pituitary of the female rat with particular reference to the effects of prolonged administration on the levels of cells,** J. M. Wolfe and J. B. Hamilton (*Endocrinology, 25 (1939), No. 4, pp. 572–584*).—Changes in the cells and weights of the pituitaries of immature and mature ♀ rats from the administration of testosterone propionate were noted. The masculinizing effects were related to the amount of androgen received.

**The comparative anatomy of the mammary glands, with special reference to the udder of cattle,** C. W. TURNER (*Columbia, Mo.: Univ. Coop. Store, 1939, pp. [5]+373+[4], pls. 54, figs. 15*).—From studies at the Missouri Experiment Station, a comprehensive account is given of the anatomy and development of the mammary gland.

**Maturation and cleavage figures in ovarian ova,** E. W. DEMPSEY (*Anat. Rec., 75 (1939), No. 2, pp. 223–235, pls. 3*).—Maturation figures in guinea pig ova removed at different stages of the ovarian cycle induced by the administration of various hormones were described. Similar maturation figures in the atretic ova were also noted. It does not seem that pituitary hormones are necessary for the initiation of maturation changes observed in the ova.

**The comparative behavior of mammalian eggs in vivo and in vitro.—V, The effects of mitosis-inhibiting treatments on normally fertilized precleavage rabbit eggs,** G. PINCUS and C. H. WADDINGTON (*Jour. Hered., 30 (1939), No. 12, pp. 514–518, figs. 3*).—Continuing this series (E. S. R., 82, p. 612), the authors found that the normal cleavage rate of normally fertilized rabbit ova in vitro was inhibited by dilute solutions of ether, alcohol, and colchicine and by supranormal temperatures. Since the rate of cleavage and chromosome division seemed differentially affected, tetraploid ova were formed in several cases. Such ova generally failed to cleave over the 1-day interval in culture, or if they did cleave the rate was slow.

**The prenatal growth of the cat.—VIII, The weights of the kidneys, bladder, gonads, and uterus, with weights of the adult organs,** H. B. LATIMER (*Growth, 3 (1939), No. 2, pp. 89–108, figs. 4*).—Data are presented on the weights of these organs and their relation to body weight and length in cats through fetal and adult life.

**Prolonged vaginal bleeding and fetal resorption in the Albany strain of rats,** E. BURACK, J. M. WOLFE, and A. W. WRIGHT (*Anat. Rec., 75 (1939), No. 1, pp. 1–17, pl. 1, figs. 3*).—Study was made of the incidence of the placental sign, fetal resorption, and vaginal bleeding in a strain of rats designated as Albany, in which spontaneous mammary fibroadenomata were frequent and fertility was low. When the results of this strain were compared with a normal strain, it was found that 25 percent of 174 breeding ♀♀ in the Albany strain showed histories of fetal resorption. In ♀♀ of this strain the placental sign occurred about 1 day earlier and the duration of vaginal bleeding averaged 2.3 days longer than in the normal strain. The number of young per pregnancy averaged 5.4 as contrasted with 8.7 in the controls. Excessive resorption of the fetuses of the Albany strain reduced litter sizes. This was correlated with a longer gestation period and resorption of all or part of the litter.

**Physical conditions in the uterus governing the duration of pregnancy,** S. R. M. REYNOLDS and F. I. FOSTER (*Anat. Rec., 75 (1939), No. 2, pp. 175–193, pl. 1, figs. 2*).—Study was made of the intrauterine pressure in 20 pregnant rabbits varying from 16 to 31 days after mating. The results showed that peaks of pressure were reached on the twenty-second day and at term. Changes in the shape of the conceptus and changes in the maternal blood supply of the placenta were responsible for changes in pressure. The end of pregnancy was induced when the pressure in the placental bed was sufficiently high to affect adversely the flow of maternal blood and nutritional supply through the placenta.

## FIELD CROPS

**[Field crops research in Arkansas],** L. M. HUMPHREY, B. JOHNSON, C. G. SCHMITT, C. H. WADLEIGH, W. H. THARP, M. NELSON, C. K. MCCLELLAND, L. C. KAPP, and E. L. NIELSEN (*Arkansas Sta. Bul. 386 (1940), pp. 16–30, 35–49*).—

Field crops work (E. S. R., 80, p. 755) at the station and substations reported on briefly included variety trials with cotton, corn, wheat, oats, rye, barley, grain sorghum and sorgo, soybeans, cowpeas, and peanuts; oil contents of soybean varieties; breeding work with corn, cotton, and oats; fertilizer trials with cotton (formulas and rates), rice, and barley; winter hardiness, including refrigeration, experiments with oats; cultural, including planting, tests with cotton, corn, and oats; residual effects of summer legumes and winter cover crops on subsequent yields of cotton and corn; interplanting of legumes in corn and effects on yields of the succeeding crop of oats and cotton; effect of fertilizers on yield and growth of rice; winter cover crops for rice; effects of nutrient, amendment, and other elements on rice, their availability, and relation to sterility in nutrient solutions; cotton experiments, including the effect of skips of different lengths on cotton yields, effects of fertilizer applications upon fiber quality and on fruiting parts, nutritional studies, and measurement of fibers of varieties of cotton; and pasture investigations, including fertilization, effects of burning, tests of meadow and pasture plants, and cytological studies of grass species.

**[Field crops experiments in Delaware]**, G. L. SCHUSTER, C. E. PHILLIPS, and G. M. GILLIGAN (*Delaware Sta. Bul. 220 (1939), pp. 11–13, 21*).—Progress reports are given on fertilizer experiments with wheat, nutrient absorption by sweetpotatoes as affected by fertilizer placement on Sassafras sand, yield tests of corn hybrids and varieties, trials of barley varieties, selection and improvement of Korean lespedeza, and tests of ryegrass as a cover crop.

**[Crop experiments in Mississippi]** (*Miss. Farm. Res.* [*Mississippi Sta.*], *3 (1940), No. 2, pp. 1, 2, 3–5, 6, 7, 8*).—Recent findings in experiments with field crops are reported in the following articles: Acid Treatment or Scarifying Improves Kudzu Germination, by H. W. Bennett; Neutral Versus Acid Fertilizers for Cotton, by J. L. Anthony, J. Pitner, and C. Dorman; Sweetpotato Plant Production Don'ts, by W. S. Anderson; Improved Quality Sericea Hay by Early Harvesting; Nebraska Potatoes Outyield Others at Crystal Springs, by J. A. Campbell; Cotton Variety Tests, by H. A. York; Winter Preparation of Cotton Seedbed Most Profitable, by I. E. Hamblin; and Fertilizer Doubles Yield of Oats in Hill Section, by J. Pitner.

**[Higher crop yields as results of station research]** (*Mississippi Sta. Spec. Bul., 1939, Dec., pp. 5–10, 11–15*).—Results reported in this paging show increased yields and profits to follow the use of better varieties of and fertilizers for cotton, corn, and oats, good sweetpotato varieties for starch, and disease-resistant varieties of sugarcane for sirup; better hay from improved curing methods; higher yields of pasture and legume hay crops resulting from applications of superphosphate; and the profitable use on cotton of fertilizer neutralized with dolomite limestone.

**[Field crops work in New Mexico]**. (Partly coop. U. S. D. A. et al.). (*New Mexico Sta. Rpt. 1939, pp. 15–34, 56, 58, 59, 60, 61, 63, 64, 66, figs. 2*).—Agronomic work (E. S. R., 81, p. 775) reported on from the station and on outlying fields included variety tests with winter- and spring-sown wheat and barley, corn for grain and silage, grain sorghum, sorgo, millet, cotton, potatoes, sugar beets for yield and curly top resistance, soybeans, cowpeas, beans, annual hay crops, tobacco, and miscellaneous forage crops; breeding work with sugar beets, barley, cotton, and pinto beans; cultural tests with potatoes; fertilizer experiments with sugar beets, cotton, and alfalfa; tests of sesbania for green manure; date of planting and plant bed experiments with sweetpotatoes; tests of different forms of sulfur, seed treatments, irrigation tests, and grade and staple estimates, all with cotton; studies of the annual production of sugar beet seed, concerned

with effects of preceding crops and green manures, and of various fertilizers and manure; crop rotations; studies of the restoration of ranges by natural and artificial revegetation; and control of Johnson grass by chlorates, hoeing, and burning, and of bindweed by different herbicides.

**Variety tests of crops,** H. L. WALSTER (*North Dakota Sta. Bimo. Bul., 2 (1940), No. 3, p. 2*).—The function and scope of crop variety tests are summarized.

**Cereal crops in western North Dakota, Dickinson Substation,** R. W. SMITH. (Coop. U. S. D. A.). (*North Dakota Sta. Bimo. Bul., 2 (1940), No. 3, pp. 8–11*).—Outstanding varieties of spring and winter wheat, rye, emmer, oats, barley, corn, flax, safflower, proso, sorgo, and grain sorghum are indicated from tests in 1939 and over the past decade.

**Farm records show grain yields best when seeded early in April** (*Wisconsin Sta. Bul. 446 (1939), p. 86*).—The higher acre yields of oats and barley were obtained from plantings April 1–15.

**Yield and composition of Everglades grass crops in relation to fertilizer treatment,** J. R. NELLER and A. DAANE (*Florida Sta. Bul. 338 (1939), pp. 30, figs. 6*).—Experiments on the effects of fertilizers on yield and composition of grass crops on sawgrass peat, 1931–37, are reported, and climate, soils, and necessary water control are discussed in relation to growing grass crops in the Everglades.

Phosphorus received special attention, for the Everglades organic soils are low in reserves and adequate phosphorus is essential in growth of bone in grazing animals. Samples of grasses plucked from five pastures on three dates in 1934 averaged for Dallis grass 0.9 and 0.81 percent $P_2O_5$, oven-dry basis, carib 1.01, centipede 0.72, and carpet grass 1.16 percent. The tests showed that phosphate enough to make good grass yields also insures a phosphorus content exceeding that found in the grass of Florida ranges where healthy cattle are raised (E. S. R., 71, p. 82), i. e., 0.31 percent and above. Adequate quantities of calcium, magnesium, and iron also present were due to plentiful supplies in subsurface waters.

A plat study of Dallis grass pasture showed that phosphate and potash equivalent to 500 lb. per acre of an 0–6–12 formula should be applied at least annually to keep the pasture at a rather high productivity, and this observation was supported by greenhouse findings. In the greenhouse, Dallis grass did not respond to soil treatments of iron and nitrogen. Yields of hay from plats receiving potassium were similar whether as chloride or sulfate.

Thirty-three cuttings of Dallis grass hay from a fertility series, 1931–37, inclusive, gave an average annual yield (dry basis) of 5,633 lb. per acre with no fertilizer, 14,559 lb. with phosphate and potash equivalent to 500 lb. per acre of an 0–12–24 mixture, 13,274 lb. with 0–6–24 but with hay lower in phosphorus 11,201 lb. with 0–12–12, and 11,345 lb. with an 0–6–12 mixture. Rapid depletion of reserves of available plant food in these soils was illustrated by marked declines in yields following omission of fertilizers in 1937 on certain plats.

Carpet grass in field fertilizer trials, 1931–37, made an average annual yield of 8,824 lb. per acre, dry basis, where phosphate and potash were supplied equivalent to 500 lb. of 0–6–12 formula. Marked responses to both phosphate and potash were observed.

**Barley varieties registered, V,** H. K. HAYES. (U. S. D. A. et al.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 1, p. 84*).—Rex, a lax two-rowed, hulled, smooth-awned barley derived from Velvet × Hannchen, was approved for registration (E. S. R., 79, p. 187) in 1939.

**The hazard of basing permanent grazing capacity on Bromus tectorum,** G. STEWART and A. E. YOUNG. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 12, pp. 1002–1015, figs. 3*).—The data obtained during the 1937 and 1938 grazing seasons in Gem County, Idaho, made clear the extremely great economic hazard and the management difficulties involved when the perennial grazing capacity is based on the fall annual grass downy chess (*B. tectorum*), locally known as cheat grass. This hazard consists largely of the wide variations in forage production from one year to another and the uncertainty as to whether there will occur any production great enough in volume to serve as a basis for livestock grazing. The ecological history and the distribution and economic importance of the grass are described.

**Chess or cheat,** H. M. BROWN (*Michigan Sta. Quart. Bul., 22 (1940), No. 3, pp. 162, 163*).—Chess or cheat, a winter annual grass which when sown in the fall or early winter grows like fall-sown barley, rye, spelt, and wheat, develops only from chess seed and not from injured seedlings of other species. Control measures, chiefly preventive, involve the planting of chess-free seed of winter grains, the eradication of chess plants through the use of hay or spring-sown crops, and the application of chess-infested manure only at the proper time in the crop rotation, i. e., just prior to a spring-sown crop.

**The relations of color to germination and other characters of red, alsike, and white clover seeds,** D. C. SMITH. (Oreg. Expt. Sta.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 1, pp. 64–71*).—The purple and yellowish-purple seeds averaged higher in weight than other colors in red clover, and darker colored seeds were also heavier in alsike and white clovers. Intermediate seed colors were generally most numerous in all clovers studied. Dark colors were frequent in alsike but less so in red and white clovers. In total germination on blotters, yellow or yellowish seeds were superior in red clover, darker colors in alsike clover, and yellow in white clover. Hard seeds were most frequent in purple and purplish groups in red clover, in green and blackish-green in alsike clover, and in red and yellowish-red in white clover. Germination in soil was highest in the darker colors in alsike clover and yellow in white clover, while color differences in soil germination of red clover were very slight. The average number of seeds per pound calculated for the samples studied were red clover 293,600, alsike clover 677,000, and white clover 836,100.

**The pubescent characteristic of red clover, Trifolium pratense, as related to the determination of origin of the seed,** E. A. HOLLOWELL. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 1, pp. 1–11, figs. 4*).—Seedling plants of European forms of red clover having appressed pubescence could be distinguished from the rough pubescent American forms in greenhouse plantings, and this afforded a rapid method to determine the proportion of each form in samples of red clover seed. This method, when applied to Canadian importations of red clover seed made in the fall and winter of 1938–39, indicated that European red clover seed in some lots had been blended with or substituted for Canadian-grown seed. This was supported by the presence of characteristic European weed seed found in European red clover seed, not present in Canadian-grown red clover seed.

**[Corn research in Iowa],** W. H. PIERRE, L. W. FORMAN, H. R. MELDRUM, A. J. ENGLEHORN, H. J. BARRE, J. B. DAVIDSON, J. L. ROBINSON, G. SEMENIUK, W. ASHBY, W. MCARTHUR, E. C. PARKER, M. T. JENKINS, W. A. MATTICE, C. K SHEDD, E. V. COLLINS, A. L. BAKKE, R. M. HIXON, W. G. GAESSLER, R. H. PORTER, A. A. BRYAN, M. S. ZUBER, R. C. ECKHARDT, H. D. HUGHES, J. C. ELDREDGE, L. C. BURNETT, J. R. WENTZ, E. W. LINDSTROM, J. N. MARTIN, W. E. LOOMIS, and J. M. AIKEN. (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1939, pt. 2, pp. 8–14,*

*21–30, 32–39, 41–47, 51–54, figs. 9*).—Corn investigations (E. S. R., 81, p. 38) continued as projects under the Iowa Corn Research Institute were concerned with genetic relations of inbred lines, including second cycle inbred lines and growth curves of inbred and hybrid corn; genetic studies; improving inbred lines by crossing followed by selfing and sibbing; improvement through the use of inbred lines; growth response of hybrids and varieties on soils of different levels of fertility; tests of varieties, strains, and hybrid combinations in different parts of Iowa; a comparative study of the stem and root development of some varieties of field corn grown in Iowa, as to the anatomical features at successive stages of development; measurement of limiting environmental factors in growth of the plant at different rates and spacings; translocation gradients in the corn plant and their relation to photosynthesis and yield; storage and curing of corn; maintenance of pure seed sources of improved varieties through field inspection and certification; production and distribution of seed of corn hybrids and of their parents; and breeding and varietal studies with popcorn. Other work related to corn production dealt with seed increase of new or improved varieties of field crops, technics used in seed analysis (including data on the germination of alfalfa and clover seeds), physiology of field bindweed (*Convolvulus arvensis*), weed control in growing corn, effects of fertilizers on crops and soil conditions under various rotations in the Wisconsin drift soil area, effects of different rates and dates of fertilizer applications in a 4-yr. rotation on crops and soil conditions on Clarion loam, and effects of various fertilizer materials on crop growth on Carrington, Grundy, and Webster soils, Clarion loam, Tama and Marshall silt loams, and several minor soils, and on the chemical and bacteriological conditions in the soils.

**The 1939 Iowa corn yield test**, J. L. ROBINSON and M. S. ZUBER. (Coop. U. S. D. A. et al.). (*Iowa Sta. Bul. P2, n. ser. (1940), pp. 33–112, fig. 1*).—The 1,214 entries in the 12 fields of the 1939 Iowa corn yield test were grown cooperatively in the same groupings as in 1938 (E. S. R., 81, p. 38). The long ripening season of 1939 permitted late, unadapted corns to mature in the northern section where they normally would be too late. Many hybrids which performed well in the northern and north-central sections might be unsatisfactory in a season with a less favorable autumn. The average yield of all hybrids exceeded that of open-pollinated varieties in each of the 12 districts, and the average advantage of hybrids for the entire State was 14 percent. However, all hybrids in the test were not superior, for in 6 districts the lowest yield was made by an open-pollinated variety, in 2 by an experimental hybrid, and in 4 by a regular hybrid. Data indicate that yield differences between hybrids with identical pedigrees may be accounted for largely by differences in percentage of stand.

The section entries with highest performance scores in the regular hybrid and experimental hybrid classes, respectively, were for the northern section Iowa Hybrid 939, Farmers 322; north-central section Pioneer 307, Funk Hybrid G–37; south-central section Ioway-Supercorn 119–H, Feldcorn 660; and for the southern section Ioway-Supercorn 121–H and U. S. Hybrid 44, Null N–62. Because of performance in the northern section, the grower of Iowa Hybrid 939 was awarded a trophy for the regular section entry with the highest performance score.

**Kansas corn tests, 1939**, A. L. CLAPP, R. W. JUGENHEIMER, H. D. HOLLEMBEAK, and L. N. SKOLD. (Coop. U. S. D. A.). (*Kansas Sta. Bul. 286 (1940), pp. 29, fig. 1*).—The Kansas corn testing program, begun in 1923, includes adapted, open-pollinated varieties and hybrids (E. S. R., 81, p. 205)

produced and distributed by Federal, State, and commercial agencies, and considers the characters resistance to lodging, drought, diseases, and insects, and yield, suckers, plant and ear height, ear drop, ear size, maturity, shelling percentage, and test weight. New experimental double crosses are tested at Manhattan and in selected outlying fields; advance tests are conducted on substations, experiment fields, and in performance tests; and the relatively few hybrids showing widest adaptation are then entered in the cooperative strip tests. The Kansas corn performance tests were added to the program in 1939 to increase hybrid testing facilities. Test fields located in each of 5 districts included 1 on bottom land and 1 on upland, and each field contained from 60 to 70 entries, replicated 5 times. Yields of the 2 entries are reported on a corrected shelled corn basis. Results of corn variety and hybrid strip tests conducted on farms to obtain information over a wide range of conditions are also summarized by districts.

Seasonal conditions vary from year to year and with such variation there are differences in response of corn hybrids and varieties. The results, therefore, indicate comparative values of the various entries in a season similar to 1939. Preliminary results indicated that some hybrids developed in this hybrid corn breeding program are superior to varieties and hybrids currently available for farm planting.

**Measuring hybrid corns for Michigan 1938–1939 trials,** H. C. Rather and A. R. Marston (*Michigan Sta. Quart. Bul., 22 (1940), No. 3, pp. 135–146, figs. 4*).—Comparative trials of corn hybrids and varieties in 1938 and 1939, more extensive than previous tests (E. S. R., 81, p. 205), are reported from a number of localities, and a maturity classification of corn hybrids based on these trials is shown for the eight corn-growing zones of Michigan. Proved certified hybrids of which seed is available for planting in 1940 include Michigan 561 and 1218, Minnesota 402, and Wisconsin 606 and 645.

**Resistance of corn seedlings to high temperatures in laboratory tests,** E. G. Heyne and H. H. Laude. (Kans. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 2, pp. 116–126, figs. 6*).—The reaction of corn seedlings to artificial heat was found to correlate well with the behavior of the same strains under field conditions. Seedlings from 10 to 14 days old treated for 5 hr. at 130° F., with a relative humidity of from 25 to 30 percent, were more heat tolerant than those at later stages of early development. Results of decapitation experiments and decline in weight of seeds indicated that after 14 days the young plants had exhausted most of the food material from the endosperm. Heat resistance of corn seedlings kept in the dark for from 12 to 18 hr. was increased considerably by exposure to light for as short as 1 hr. The testing of seedlings for heat resistance evidently can be relied upon with considerable assurance for distinguishing genetic differences in drought tolerance of larger plants of different strains of corn, and such a test appears to be a valuable supplement to field studies of drought resistance. See also earlier notes (E. S. R., 76, p. 471; 81, p. 503).

**Spacing of corn used as green manure,** J. Bushnell. (Ohio Expt. Sta.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 2, pp. 154, 155*).—When Blue Ridge, a long season corn, was planted in late May in spacings 8 by 12 in. to 32 by 12 in. and sampled in late September, the closer spacing resulted in a larger production of total dry matter, a decline in the percentage of nitrogen in the dry matter, and a fairly constant nitrogen content per acre. The uniformity of the nitrogen content per acre suggested that nitrogen was a limiting factor, and that plants in wide and narrow spacings could use available nitrogen as effectively. The more fertile Chippewa loam produced distinctly larger amounts of dry matter,

but the percentage of nitrogen was no higher than on Canfield silt loam. A crop with such a low nitrogen content, only 0.6 percent of the dry matter, ordinarily would not be considered suitable for green manure purposes, but it was being used experimentally on heavy soils with the aim of incorporating enough bulk of coarse organic matter to improve drainage and aeration (E. S. R., 73, p. 470) of the plowed horizon, e. g., for potatoes.

**Registration of improved cotton varieties, II,** H. B. Brown. (U. S. D. A., La. Expt. Sta., et al.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 1, p. 83*).—Texacala, formerly known as Rogers Acala III, originated from a plant selection of Acala, was approved for registration (E. S. R., 76, p. 620) in 1939. Its adaptations and characteristics are described briefly.

**The effect of maturity at time of harvest on certain responses of seed of crested wheatgrass, Agropyron cristatum (L.) Gaertn.,** E. McKay and W. Hermann. (Wash. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 10, pp. 876–885, fig. 1*).—Germination tests of seed of crested wheatgrass harvested at different stages of maturity and stored for various periods showed that seed harvested in the early dough stage may have high viability, but that vigorous plants probably cannot be expected from seed harvested before the hard dough stage. At favorable temperatures, germination and vigor of hard dough seed has been as good as in more mature seed, but a decrease of germination in hard dough seed chilled for a week indicated that it may be slightly less hardy.

**Registration of varieties and strains of oats, IX,** T. R. Stanton. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 1, pp. 76–82*).—Oats varieties approved for registration (E. S. R., 80, p. 762) and described, with performance records, included Boone, derived from Victoria × Richland, and Hancock, from Markton × Rainbow, both early yellow oats; Marion, an early white oats, derived from Markton × Rainbow; and Fulwin and Tennex, both midseason red oats and sister strains originating as reselections from Fulghum (winter type).

**Huron, a new oat variety for Michigan,** E. E. Down and J. W. Thayer. (Coop. U. S. D. A.). (*Michigan Sta. Quart. Bul., 22 (1940), No. 3, pp. 209–212*).—Huron oats, a high-yielding, medium-early, high test weight, highly smut-resistant, yellowish-grained variety, was selected from a cross made between Markton and Victory by G. A. Wiebe. The plants are about 4 in. shorter and have about the same stiffness of straw as Wolverine. Huron is recommended for those soils of the lower peninsula of Michigan where Wolverine oats are adapted.

**Hybridizing oats to combine growth for winter pasture, hardiness, and resistance to rusts and smuts,** H. R. Rosen, L. M. Weetman, and C. K. McClelland. (Ark. Expt. Sta.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 1, pp. 12–14*).—Promising oats hybrids combining these characteristics are listed, with remarks on the progress of oats breeding work at the station.

**Production and marketing of Michigan's field peas,** B. R. Churchill (*Michigan Sta. Quart. Bul., 22 (1940), No. 3, pp. 190–193*).—The 90-percent decline in the Michigan field pea crop since 1910, while attributed largely to the pea aphid, weevil, and moth, appeared due also to the small size (less than 16/64 round screen) of the native Chippewa peas as grown in the present producing district, as compared with the O. A. C. 181 variety grown under like conditions. Rate and date of planting had little influence at Chatham upon size of peas. Practical recommendations from the experiments and experiences include use of O. A. C. 181, growing peas in a 4-yr. or longer rotation and practicing fall plowing, planting from 2 to 2.5 bu. on clean, well-prepared seedbed, use of the McNaughton system of stacking for outside threshing, and reduction of speed of the thresher cylinder to avoid cracking peas.

**Urea as a source of nitrogen for potatoes in the Hastings area, R. V. Allison.** (Fla. Expt. Sta.). (*Amer. Fert., 92 (1940), No. 2, pp. 8, 9*).—Fertilizer tests 1936-39, on Bladen fine sand and fine sandy loam and Portsmouth loam suggested that a rather definite saving might be effected in fertilizer costs for potatoes in the area through a judicious use of urea as a partial source of nitrogen. It appeared that a suboptimum water supply is rather commonly the limiting factor in potato production in the Hastings area. Most importance is to be attached to the rainfall in April unless satisfactory irrigation facilities are available.

**Germination of the seed of poverty grass, Danthonia spicata, V. K. Toole.** (U. S. D. A.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 11, pp. 954-965*).—The seed coat seemed to be the inhibiting factor in delaying germination of poverty grass, but this may be due to restriction of gas exchange since restriction of water absorption is small. Prechilling at 3° C. for 63 days or pretreatment with 71 percent sulfuric acid for from 30 to 45 min. overcame the seed coat restriction. After removal of the coat restriction by these methods, the germination temperature, light, and previous history of the sample appeared to be important factors. Maximum germination of pretreated seed was obtained at room temperature to 35° alternation.

**Sudan grass seed production under Michigan conditions, C. R. Megee** (*Michigan Sta. Quart. Bul., 22 (1940), No. 3, pp. 160, 161*).—Planting test results showed that sowing Sudan grass seed in 7-in. drill rows at from 20 to 25 lb. of seed per acre produced the maximum amount of seed, gave less trouble with weeds, required no cultivation, and produced plants fine enough to be harvested with the grain binder and threshed with the grain separator. Sudan grass should not be stacked until the stems have dried thoroughly because of danger of heating and injury to seed viability. The air-blast of the separator must be regulated carefully to prevent blowing of seed into the straw pile.

**Tobacco following bare and natural weed fallow and pure stands of certain weeds, W. M. Lunn, D. E. Brown, J. E. McMurtrey, Jr., and W. W. Garner.** (U. S. D. A. and Md. and S. C. Expt. Stas.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 11, pp. 829-845, figs. 5*).—Observations (E. S. R., 72, p. 43) that high-quality tobacco was produced consistently for the first year or two after growth of natural weed cover led to experiments to determine the value of natural weed fallow for preceding tobacco in the rotation compared with that of certain crop plants and some wild species commonly occurring in weed fallow.

Tobacco properly fertilized and grown after natural weed fallow of sufficient duration evidently has in large measure those desirable characteristics observed in the crop grown on virgin land. Tobacco grown after bare fallow has shown rapid decline in yield and gross value. Certain species appeared consistently to be much more desirable than others as preceding cover crops. Tobacco after ragweed and horseweed markedly surpassed that following bare fallow in yield and value. On the other hand, tobacco after lambsquarters was inferior in yield and value to that following bare fallow. Annual lespedeza showed no advantage; sweetclover, rabbitfoot clover, and wild pea did not always show decided advantages; while partridge-pea produced some yield increase. The natural weeds in these tests were principally species that produced high-quality leaf in pure stands, yet those found objectionable might predominate, under some conditions, with a harmful effect resulting on succeeding tobacco. A given weed species would hardly have the same effect on tobacco on all soils or conditions. The generally beneficial effect of weed fallow was the promotion of a quick start and very rapid and uniform growth of tobacco from transplanting to maturity. Within normal limits this result was associated with a uniformly high market value per acre and average price per pound.

**The effect of the vetch cropping history and chemical properties of the soil on the longevity of vetch nodule bacteria, Rhizobium leguminosarum,** W. B. ANDREWS. (Miss. Expt. Sta.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 1, pp. 42–47*).—Examination of 92 soil samples obtained from fields or woodland with known vetch history gave indications that soils which produce a good crop of vetch without addition of lime in the drill do not need inoculation when vetch is planted on the field again. The soil inoculation where excellent vetch has been grown equals or surpasses that from commercial culture. A heavy suspension of clay from soil previously growing good vetch was a satisfactory method of inoculation. The vetch nodule bacteria apparently were not as abundant in soils below pH 5.0 as above pH 5.0, but many extremely acid soils had ample supplies of nodule bacteria, and some soils above pH 5.0 had a relatively low quantity of nodule bacteria. No relation was noted between available phosphorus and soluble iron and longevity of nodule bacteria, or between the number of years of vetch or since vetch and the value of the soil for inoculating vetch.

**Registration of improved wheat varieties, XIII,** J. A. CLARK. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 1, pp. 72–75*).—Wheat varieties approved for registration (E. S. R., 79, p. 190; 80, p. 766) included Wabash, a soft red winter wheat selected from a natural hybrid found in Fultz, and the following hard red spring wheats: Renown and Regent, both derived from H-44 × Reward; and Coronation, developed from Pentad (red durum) × Marquis. Brief descriptions and records of performance are given.

**The comparative performance of some new varieties of hard red spring wheat,** T. E. STOA, R. H. HARRIS, and L. D. SIBBITT. (Coop. U. S. D. A.). (*North Dakota Sta. Bimo. Bul., 2 (1940), No. 3, pp. 3–8*).—Results of variety tests at several points, in 1939 with important and new hard red spring wheats and supplemented by data from earlier tests and milling and baking experiments, suggest that Thatcher may be considered first choice because it resists stem rust satisfactorily, is high in flour quality, and is grown so widely that seed is easily available. The best use of Ceres limits it to areas where rust injury is not common. Renown, where desired, would be grown because of higher test weight and better color of kernel and appearance than Thatcher. "Nordhougen" is a beardless variety that grows taller than Thatcher and can be harvested more easily. Rival and Pilot are regarded currently as primarily for supplementing Thatcher.

**The duration of the effects of renovation in the control of weeds and white grubs (Phyllophaga sp.) in permanent bluegrass pastures,** F. V. BURCALOW, D. W. SMITH, and L. F. GRABER. (Wis. Expt. Sta.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 1, pp. 15–22*).—Further report (E. S. R., 80, p. 481) is made on the establishment of dry-weather legumes in permanent bluegrass pastures without plowing and without destroying the grasses, designated as renovation. Such treatment was very effective in controlling weeds and white grubs (*Phyllophaga* sp.), the two common pests of permanent grasslands in southern and western Wisconsin, for the first 2 or 3 yr. after renovation, but further duration of such benefits depended on managerial treatment. With moderate grazing or its equivalent, weeds were reduced 92.5 percent and white grubs 75.2 percent in 1939 on the portions of nine pastures renovated in 1934 and 1935 when compared with adjacent unrenovated portions of equal area. On five pastures grazed excessively, such weed reductions averaged 53.8 percent and the white grub control was only 58.2 percent in 1939.

**A new selective spray for the control of certain weeds,** W. A. WESTGATE and R. N. RAYNOR (*California Sta. Bul. 634 (1940), pp. 36, figs. 16*).—Sinox

(sodium dinitro-o-cresylate), a noncorrosive, relatively nonhazardous selective herbicide used for controlling certain common broad-leaved annual weeds of cereals, flax, onions, alfalfa, corn, roadsides, and pastures, was applied in dilute solution with hand and field sprayers and with specially equipped airplanes in experiments in 1938 and 1939.

The dosage for mustards is 1 gal. of Sinox in 120 gal. of water at the rate of from 80 to 100 gal. per acre when mustard plants have developed from three to seven leaves (about from 3 to 7 in. high) and for wild radish, fireweed, and yellow star thistle in grain and flax 1:80 concentration at the rate of from 80 to 100 gal. per acre. The volume of spray may be reduced to 50 gal. per acre by increasing the concentration to 1 gal. of Sinox in 50 gal. of water. For airplane application on wild mustard, 1 gal. of Sinox is dissolved in 15 gal. of water and applied at the rate of from 12 to 15 gal. per acre, and on wild radish in the three- to seven-leaved stages 1 gal. of Sinox in 10 gal. of water at the rate of from 12 to 15 gal. per acre. Yellow star thistle growing as upright rosettes or with slender stems in alfalfa or along roadsides and fence lines or in pastures is killed by 1 gal. of Sinox to 80 gal. of water at the rate of from 200 to 300 gal. to the acre, but is not when growing as large flat rosettes in thin vegetation.

Established transplanted onions could be sprayed with safety until about 10 in. high. Seedling onions do not tolerate Sinox enough to permit spraying. While common dandelion, common plantain, and crabgrass have been controlled successfully in bluegrass lawns, definite recommendations await further experiments.

The period that the spray should remain on the weed depends upon rate of penetration, e. g., on young, succulent mustard plants with air temperatures of 55° F. and above from 2 to 4 hr., before being washed off by rain, on advanced stages of mustard from 24 to 48 hr., and on fireweed, unless very succulent, from 2 to 4 days. Weeds with succulent stems, characteristic of good growing conditions, are killed more easily than stunted or more woody-stemmed plants under adverse conditions. The chemical apparently has no practical place under California conditions in eradicating certain deep-rooted perennials. It has had no injurious effect on the soil at dosages usually needed for satisfactory control.

The total cost of controlling wild mustard with ground rigs varied in 1939 from about $1.85 to $3.50 per acre and for wild radish, yellow star thistle, and fireweed from about $2.50 to $4.50. For airplane application the cost per acre was $3.65 on wild mustard and $4.65 on wild radish.

## HORTICULTURE

**[Horticultural studies by the Arkansas Station]**, V. M. Watts, J. R. Cooper, and J. E. Vaile (*Arkansas Sta. Bul. 386 (1940), pp. 74–85*).—Among studies the progress of which is discussed are the induction of parthenocarpic fruiting in the tomato, influence of pruning on leaf anatomy and starch content of the tomato, fertilizers for peaches, vegetables, and strawberries, methods of application of fertilizer and sources of N for vegetable crops, value of barnyard manure for vegetables and strawberries, vetch as a cover crop for the apple orchard, cover crops for vegetables, sod culture for fruit orchards, irrigation of tomatoes and snap beans, mulching of the Blakemore strawberry, pruning of young peach trees, pruning of the apple tree, thinning of peach fruits, testing of fruit varieties, breeding of the strawberry, testing of tomatoes for resistance to *Septoria* leaf spot, breeding of tomatoes and

cucumbers, rest period in cucumber seeds, thinning of watermelon fruits, causes of uneven ripening of grapes, rootstocks for grapes and cherries, winter-injury resistance in brambles and relation of soil treatments thereto, late winter injury to peach buds, effect of environmental factors on sex expression in the strawberry, effect of soil reaction on the uptake of nutrients by vegetables, soil reaction requirements of the strawberry, variety testing and culture of ornamental plants for landscape uses, and varieties and culture of roses.

[**Horticultural studies by the Delaware Station**], L. R. DETJEN, E. W. GREVE, C. E. PHILLIPS, and F. S. LAGASSE (*Delaware Sta. Bul. 220 (1939), pp. 28–33*).—Progress statements are presented on the following studies: The relation of curculio injury to the premature dropping of apple and peach fruits, effect of position of seedstalk on the cabbage plant to the time of flower stalk development in the progeny, effect of seedling- and own-rooted understocks on the growth of pruned and unpruned apple trees, Malling understocks for Blaxtayman and Gallia Beauty apple trees, soil management of apple orchards, magnesium requirements of peach trees, and carbohydrate-nitrogen relationships in apple trees receiving various nitrogen treatments.

[**Horticultural studies by the New Mexico Station**] (*New Mexico Sta. Rpt. 1939, pp. 51–56, 56–58, 59, 60, 61, 65, 66, 67, figs. 3*).—Included are progress reports on phenological investigations with fruits and nuts, orchard heating, testing of varieties of tomatoes, chile and paprika, pecans and walnuts, and grapes, culture of head lettuce, testing of sweet peas and chrysanthemums, production of vegetable seeds, selection in the White Grano onion, and the effect of irrigation treatment on the growth and yield of the White Grano onion.

**The problem of nomenclature under present-day conditions**, M. J. DORSEY. (Univ. Ill.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 393–397*).—The author discusses the many problems that confront the pomologist in the naming of horticultural plants. Among confusing factors are the many bud sports, the renaming of varieties by unscrupulous parties, and the increased importance of the variety names in the mind of the consumer. There is a need of permanent records and files backed by adequate research where essential to clarify existing confusion.

**Response of four vegetable crops to phosphate fertilizer in southern Ohio**, J. BUSHNELL. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 515–517*).—During the first 16 yr. of a fertilizer experiment carried on at the Washington County Substation, sweet corn differed from cabbage, cucumbers, and tomatoes in showing no significant response to superphosphate, being able, apparently, to secure its needs from the soil. At the end of the 16 yr., in 1931, treatments were changed to include a continuously phosphated plat, a plat first phosphated in 1931, and a plat on which phosphating was discontinued in 1931. Residual phosphorus was adequate in the previously phosphated soil so that for 5 yr. none of the crops showed a need for further phosphate. During these 5 yr., applications of superphosphate to the check plats were surprisingly ineffective. Despite the fact that 600 lb. of superphosphate were applied each year, it was not until 5 yr. had elapsed that the yields of cabbage, tomatoes, and cucumbers equaled those of the continuously phosphated plats. The plats which had adequate phosphate for all plants showed a high phosphorus content when the soil was tested by ordinary quick laboratory methods. The indications were that from 200 to 300 lb. per acre of water-extractable phosphoric acid were needed in the soil under test to insure an adequate supply for cabbage, cucumbers, and tomatoes. Apparently, the fixing power of the soil for phosphates had been saturated on the continuously phosphated plats.

**Various sources of nitrogen for potato and spinach production on Long Island**, P. H. WESSELS and R. H. WHITE-STEVENS. (Cornell Univ.). (*Amer.*

*Soc. Hort. Sci. Proc., 35 (1938), pp. 593–596).*—When nitrogen was supplied in adequate quantities for potatoes, the nature of the material was of no statistically significant important with respect to yield, provided there was no appreciable effect of the material on soil reaction. With spring spinach, both nitrate of soda and nitrate of soda plus cottonseed meal were superior to fish scrap, ammonium sulfate, cottonseed meal, cyanamide, ammonium nitrate, urea, and uramon. In general, the cost of the nitrogen in the different materials was found no index to its value in crop production.

**Lima bean production in relation to fertilizer placement and seed spacing under Long Island conditions,** R. H. White-Stevens and J. D. Hartman. (Cornell and Purdue Univs.). *(Amer. Soc. Hort. Sci. Proc., 35 (1938), p. 517).*—Comparative studies over a 3-yr. period conducted at the Long Island Vegetable Research Farm, Riverhead, N. Y., on the effect of fertilizer placement and spacing upon the yield of the Fordhook bush lima bean showed that (1) there was no advantage from applying the fertilizer in bands on either side of the seed row, either at planting or after "come-up," over the usual broadcast application, where the same analysis and amount of fertilizer was employed throughout, (2) in 2 yr. out of 3, and on the average of 3 yr., fertilizer applied as a band over the seed was deleterious as compared to broadcast application, and (3) yields were increased by increasing the concentration of seed in the row up to two beans per 9 in., or one bean per 4.5 in. These two spacings were equal in yield.

**Castorbean production evaluated,** J. F. O'Kelly *(Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 2, pp. 1, 2).*—Castor-bean plants developed best when spaced from 2 to 3 ft. apart in rows from 3 to 3.5 ft. apart. Oil content, computed on the basis of 6-percent moisture in the seed, was slightly over 45 percent. The refractive index at 40° C. ranged from 1.4716 to 1.4717, the iodine absorption number from 84.2 to 85.3, and the saponification number from 177.6 to 180.8. The highest acre average yield of oil was slightly under 300 lbs., which at current prices would not make the crop particularly attractive to growers.

**The response of early celery to fertilizer ingredients,** F. K. Crandall and T. E. Odland. (R. I. Expt. Sta.). *(Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 523–525).*—In the case of celery grown on a mineral-type soil with a small application of 8 tons per acre of stable manure, supplemented by a green manure crop of winter rye and fertilizers containing various percentages of N, P, and K, the yields were significantly lower where the N content of the standard 6–8–6 fertilizer was reduced 50 percent. An increase in N to 50 percent above the level of the standard material increased yields moderately. P did not influence yields to the same degree as did N or K, but a small decrease in yield resulted from reducing the P content of the fertilizer from 8 to 4 percent. An increase in the K from 6 to 9 percent gave a significant increase in yield, but a decrease from 6 to 3 percent did not reduce yields as greatly as did a reduction in the N content. Tests of quality by breaking, cutting, and tasting did not indicate any measurable differences due to treatments.

**Sweet corn breeding,** E. S. Haber *(Iowa Sta. Rpt. 1939, pt. 2, pp. 39, 40).*—This is a progress report upon activities during the year.

**"Midget"—a new bush cucumber,** A. E. Hutchins. (Minn. Expt. Sta.). *(Minn. Hort., 68 (1940), No. 1, pp. 8, 18, figs. 2).*—Resulting from the cross of a bush-type cucumber and a strain of pickling cucumber, the Midget has a determinate bush habit type of growth and produces fruits of small size and attractive color. Because of the small area occupied by each plant the Midget

is expected to be valuable in small gardens where standard-type cucumbers would require too much area.

**The interrelation of manure, lime, and potash on the growth and maturity of the muskmelon,** R. L. CAROLUS and O. A. LORENZ. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 518–522*).—Applications of various amounts of stable manure in conjunction with various amounts of K to muskmelons planted on a field heavily limed in 1932 and in alfalfa in the intervening period showed that manure alone at the rate of 30 tons per acre was capable of supplying sufficient K for the normal development of the plants. Without applied K, early yields were depressed as compared with 100 lb. of K per acre. When the K was increased to 200 lb. per acre, early yields declined below the 100-lb. plat, although total yields were slightly increased. The leaves of plants receiving 30 tons of manure and of those receiving 15 tons of manure and either 100 or 200 lb. of K remained green throughout the season, while leaves from other plats showed the usual symptoms of K deficiency in varying degrees.

The broadcasting of limestone in the autumn at the rate of 0, 1, 2, and 4 tons per acre in connection with manurial and fertilizer treatments gave favorable results with muskmelons on a sandy loam soil of pH 4.7 except where 4 tons of limestone were used alone. Here the total yields were lower than on the unlimed plat, suggesting the possibility of a decreased K absorption on the heavily limed plat. Manure applications hastened the ripening of the melons. An inverse relationship between K and the nitrate N content of the petioles of plants from various plats indicated a lack of N utilization under conditions of K shortage.

**The effect of various seedling treatments on growth and yield of Early Grano onions,** J. WALKER (*Amer. Soc. Hort. Sci. Proc., 35 (1938), p. 568*).—Six seed and seedling treatments were studied. Observations on the effect of each treatment were made during the growing season, and yield data secured when the onions were mature. Average size of bulbs harvested corresponded very closely with the vigor and development of plants observed and recorded during the growing season, that is, the greater the vigor the larger were the bulbs. With one exception, average weight of tops and roots corresponded with average weight of bulbs. Transplanting in itself did not bring about increased size or yield of bulbs, but transplanting and top dressing with commercial fertilizer gave increased returns. Seedlings that were checked in growth by being subjected to low temperatures and by having top growth clipped off at intervals gave a yield of about 50 percent that of seedlings sown later, grown under favorable conditions for growth, and forced by the application of commercial fertilizer. Results indicated that high yields of Early Grano onions may be secured if seed is sown indoors comparatively late (early in April), and the seedlings forced by applications of commercial fertilizer. By this method the cost of handling and producing the crop may be greatly reduced.

**Progress report on fruit breeding,** G. T. SPINKS (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1938, pp. 47–53*).—Brief comments are presented on apple, pear, plum, black currant, blackberry, raspberry, and strawberry seedlings. Among named varieties resulting from the breeding work are Gloucester Cross, Hereford Cross, Newport Cross, Taunton Cross, and Worcester Cross apples; Bristol Cross pear; Avon Cross, Severn Cross, and Wye Cross plums; Cotswold Cross and Mendip Cross black currants; and Ashton Cross blackberry.

**Further results on the influence of branch ringing on fruit set and size,** A. E. MURNEEK. (Mo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 398–400*).—Continuing the study (E. S. R., 80, p. 488), the author observed that not only was the percentage of set markedly increased by branch ringing

but also the size of the fruits, despite the fact that there were more on the ringed limbs. The temporary isolation above the ring of synthesized carbohydrates and other food materials was evidently effective in increasing both fruit setting and size. Since the increase in fruit size was about the same when ringing was delayed as much as 10 weeks after blooming as when performed earlier, it was evident that the carbohydrates played a dominant part in the increased size of the fruits.

**"Thin wood" pruning considered from the standpoint of photosynthate production,** B. S. PICKETT (*Michigan Sta. Tech. Bul. 169 (1940), pp. 20, figs. 4*).—Based on the results of an earlier investigation (E. S. R., 74, p. 642), in which it was shown that "thick" bearing wood of the apple is more productive than "thin" wood, an experiment was initiated to determine the factors underlying this difference. The leaves of the thick branches were much thicker than those of the thin branches. There were three or four layers of palisade cells in the thick wood leaves and only one layer in those from thin wood. The terminal growth of the thin wood was short and weak and increased slowly in size and weight as compared with thick wood. Measurement of organic matter produced by the leaves showed a high degree of correlation, $r=0.899$, between light and the production of organic matter. However, thin wood leaves apparently were as efficient per unit of leaf area per unit of light received. It was obvious that thin wood leaves could produce from −1.82 to 2.35 gm. of organic matter and thick wood leaves from 4.19 to 8.31 gm. per square meter of leaf surface per day under average growing conditions in southern Michigan. Thin branches did not increase in bulk as rapidly as thick branches, but the leaves on thin wood apparently were generally able to provide enough organic material to account for any gain in bulk they made. It is concluded that thin branches are not parasitic except under the most extreme conditions. The desirability of removing thin wood rather than thick wood in pruning was borne out by the findings.

**Apple root-stock investigations.—Progress report,** G. T. SPINKS (*Univ. Bristol, Agr. and Hort. Res. Sta., Long Ashton, Ann. Rpt., 1938, pp. 40–46*).—Observations on the growth and fruiting of a number of English varieties of apple on 15 clonal rootstocks, including Malling II and XII and Long Ashton selections, indicated the superiority of certain stocks. None of the stocks was immune to woolly apple aphid. Malling XII and Long Ashton G8, E7, and G7 produced large trees. Of the Long Ashton stocks, G8, E7, and E8 appeared most promising.

**Maturity studies with Jonathan and Grimes Golden apples,** C. O. HESSE and C. W. HITZ. (Md. Expt. Sta. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 351–357, figs. 5*).—In an attempt to arrive at reliable indexes for proper picking maturity, various procedures, such as the pressure test, electrical maturity test, color changes, and chemical determinations, were tested. In one instance, where test samples of fruit were taken at 2-day intervals and storage samples at weekly intervals during the ripening season, the estimated daily decrease in pressure was too slight to serve as an adequate index to maturity. Even on a weekly basis the differences were only barely significant. An inverse relation between fruit size and pressure reading was evident throughout the season. In the electrical determination test certain factors other than maturity complicated the results. With Grimes Golden, ground color changes were not adequate to measure maturity. With Jonathan, the results suggested that 40 percent red color is necessary before the fruits will develop the best edible quality after picking. As to sugar content, there was no apparent relation between the changes observed and maturity. In

Grimes Golden there was a decrease in 1935 from about 7 percent starch at the first harvest to 2 percent at the fifth harvest, but also an unexplained rise to 4 percent later. In Jonathan the starch decrease was more pronounced. In general, none of the indexes tested proved fully satisfactory in forecasting maturity.

**Superficial scald in Granny Smith apples**, J. A. BEARE (*Jour. Dept. Agr. So. Austral., 43 (1939), No. 5, pp. 403–405*).—The use of oiled wrappers gave excellent results in the control of scald, making possible the picking of the fruits in prime condition. For four treatments, (1) unwrapped, (2) unwrapped but with shredded oiled paper between layers, (3) plain sulfite wraps, and (4) oiled sulfite wraps, the percentages of scalded fruits were, respectively, 82.3, 3.8, 61.4, and 1.3.

**A preliminary report on the productiveness of secondary and lateral peach shoots**, T. E. ASHLEY. (Miss. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 413, 414*).—Data taken on 5-year-old Hiley trees of moderate vigor showed that in every instance the number of fruit buds per shoot, total buds per shoot, and average number of buds per shoot was greater in the lateral than in the secondary shoots. In all cases except the 6- to 12-in. class, the percentage of fruits set and the total fruits matured was greater in the laterals.

**Respiration and emanation of volatiles from Bartlett pears as influenced by ripening and storage**, F. GERHARDT and B. D. EZELL. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 423–426, fig. 1*).—Determinations made of the respiratory activity and the emanation of volatiles from Bartlett pears placed immediately following harvest in a ripening room at a temperature of 65° F. and a relative humidity of approximately 80 percent showed that the respiratory climacteric occurred some 7 or 8 days earlier than did the climacteric for the emanation of volatiles. Both curves were S-shaped in character and typified true autocatalytic reactions. Acetaldehyde accumulation in the tissue roughly paralleled the emanation of total volatiles, the increase in both cases being associated with the appearance of scald or core break-down. It is concluded that a considerable proportion of the total emanation from Bartlett pears may result from the gross liberation of acetaldehydes from the tissues. The tempo of both respiration and volatile emanation was increased when Bartlett pears were ripened after periods of storage at lower temperatures.

**The effect of ethylene on pectic changes in ripening fruits**, E. HANSEN. (Oreg. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 427, 428*).—Determinations of the soluble and insoluble pectins in the tissues of various fruits and nuts at two stages, (1) unripened fruits at time of harvest, and (2) after ethylene treatment when the fruits had reached an optimum stage of ripeness as indicated by external appearance, showed that the ethylene had a very pronounced effect upon pectic changes. Without exception, all the fruits showed well-defined increases in soluble pectin and decreases in insoluble protopectin following ethylene treatment. The rate of protopectin hydrolysis in the hulls of English walnuts was accelerated, suggesting that protopectin hydrolysis occurs not only during the loosening of the hulls but that ethylene accelerates this reaction.

**Phosphorus and nitrogen fertilization for strawberries on Long Island, New York**, J. D. HARTMAN, R. H. WHITE-STEVENS, and M. B. HOFFMAN. (Purdue and Cornell Univs.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 473–476*).—Premier (=Howard 17) strawberry plants set in the field in April were side-dressed in May with 800 lb. per acre of a 4–8–6 fertilizer and top-dressed in the autumn with 250 lb. of sodium nitrate and 250 lb. of the 4–8–6. On April 27 of the succeeding year, urea at the rate of 52 lb. per acre was broadcast over

certain systematically distributed rows. Yields recorded for the period from June 7 to June 28 showed that the urea treatment had reduced the yields. In other trials no significant differential response was obtained from varying the time of applying nitrogen in the year when the plants were set in the field. No significant response to phosphorus broadcast before the plants were set was noted on a soil which required large applications of superphosphate for maximum growth of many vegetables. The average yield of all plats receiving phosphorus was actually lower than that of all plats receiving no phosphorus.

**Testing vinifera grape varieties grafted on phylloxera-resistant rootstocks in California,** G. C. Husmann, E. Snyder, and F. L. Husmann (*U. S. Dept. Agr., Tech. Bul. 697 (1939), pp. 64, figs. 5*).—Beginning with a general description of the vinifera grape industry in California, the importance of phylloxera injury, and description of the various experimental vineyards, detailed data are presented in tabular form on the flowering, fruiting, and growth characters of a large number of varieties and hybrids.

Among observations are that resistant rootstocks make possible the continuance of vineyards for at least a period of from 20 to 30 yr. Great variation was found among the various rootstocks, with indications that the more vigorous stocks have wide adaptability in the State. Many vinifera stock combinations proved satisfactory, indicating that the affinity of stock and scion has not been a major factor in the success of grafted vines. Only slight differences in periodic growth phenomena were apparent when a variety was grafted on various rootstocks.

**Root temperature effects on the growth of walnut and avocado seedlings,** A. R. C. Haas. (Univ. Calif.). (*Calif. Avocado Assoc. Yearbook, 1939, pp. 96–102*).—With solutions maintained at approximately constant temperatures of 10°, 17°, 24°, 31°, and 38° C. and an air temperature averaging 25° over the experimental period, the best growth of walnut seedlings was secured at 24° (65.2° F.). Growth was better at 17° than at 31°, and all plants were quickly injured at 38°. Where sodium chloride was added to the nutrient solutions the roots were usually dark and with enlarged tips, as compared with a healthy white color for the controls. Transpiration measurements showed the greatest water losses at 17° and 24°. There was some evidence that the internal temperatures of the trunks and leaves were affected by those of the solutions.

In the case of Puebla avocado seedlings, the greatest fresh and dry weights of the trunks were secured in soil held at 31°. The fresh weight of the avocado roots was greatest at 24°.

**Effects of pH on the growth of avocado seedlings,** A. R. C. Haas. (Calif. Citrus Expt. Sta.). (*Calif. Avocado Assoc. Yearbook, 1939, pp. 110–112, figs. 2*).—In this study in which avocado seedlings were grown in cultural solutions the pH values of which were adjusted twice a week with different materials to 4.5 and 6.0, respectively, it was found that pH 4.5 was the more favorable, as indicated in the dark-green color of the leaves and the greater length of the roots. Further experiments in soil showed distinctly better growth at the more acid, lower pH values.

**Avocado leaf symptoms characteristic of potassium, phosphate, manganese, and boron deficiencies in solution cultures,** A. R. C. Haas. (Calif. Citrus Expt. Sta.). (*Calif. Avocado Assoc. Yearbook, 1939, pp. 103–109, figs. 5*).—By growing avocado seedlings in nutrient solutions deficient in P, K, Mn, and B there were produced leaf deficiency symptoms which are herein illustrated and described with the thought that the information may be helpful in the future if such symptoms should appear in the orchard.

**Growth and transpiration in avocado seedlings as affected by artificial winds of low intensity,** A. R. C. Haas. (Calif. Citrus Expt. Sta.). (*Calif.*

*Avocado Assoc. Yearbook, 1939, pp. 92–96*).—Puebla seedlings grown in sealed containers with stoppered openings to permit the introduction of water and amendments were exposed to the wind generated by an electrical fan. The addition of C. P. sodium chloride to the soil was reflected in burned leaf tissue, roughly in proportion to the amount of salt added. The effect of the wind on transpiration was to increase water loss, primarily during the early stages of the experimental treatment. In the latter half of the experimental period the water loss was least in the wind-exposed plants, and the totals for the whole period were, in every case, somewhat less in the wind-subjected cultures. It is suggested that the partial closing of the stomata of the leaves in the wind-exposed plants may have been a factor in the results.

**Responses of citrus trees to manganese applications.—A preliminary report,** E. R. Parker, R. W. Southwick, and H. D. Chapman. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 25 (1940), No. 3, pp. 74, 86, 87, fig. 1*).—In this preliminary report on studies in Ventura County, Calif., promising results were secured in correcting a leaf disorder characterized by a basically light-green color with veins of dark green by spraying the trees with manganese sulfate accompanied by hydrated lime and soda ash. Application of manganese sulfate to the soil near the trunks proved of no benefit, and injections directly into the limbs were not fully satisfactory.

The authors point out that, although the type of mottling caused by manganese deficiency resembles that caused by an excess of boron, iron chlorosis, and zinc deficiency, there are distinctive features, for example, the affected leaves on trees suffering from manganese deficiency are scattered throughout the tree. Manganese deficiency did not reduce leaf size, as was the case with severe zinc deficiency. It is suggested that growers who believe that their citrus trees are suffering from manganese deficiency should establish small experimental plats with adequate controls. For the present, the spray formula made up of 10 lb. of manganese sulfate (65 to 80 percent pure), 5 lb. of soda ash, and 100 gal. of water is considered advisable.

**Physiological studies of lemons in storage,** E. V. Miller and H. A. Schomer. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 432–434*).—Analyses made before, during, and at the end of the storage period upon the peel and flesh of green California lemons held at 32°, 36°, 40°, 50°, and 60° F. showed no relationship between sugar, acid, glycoside, and acetaldehyde contents and the incidence of physiological disorders. Reductase activity, on the other hand, appeared to be a factor, with low activity shown by the peel of fruits stored at temperatures most conducive to the development of pitting, namely, 32°, 36°, and 40°. Reductase activity was expressed as the time rate of reduction of standard potassium permanganate solution.

**Handling and storing small lots of dates at home,** W. R. Barger (*U. S. Dept. Agr. Cir. 553 (1940), pp. 12, figs. 6*).—Based on results of investigations of various workers, general information is presented on types of dates and common varieties, grading, changes during ripening, harvesting, cleaning, artificial ripening, equipment for ripening, curing, insect control, packages for home use, storing, and food value.

**The effect of size of young pecan trees on their subsequent growth and yield,** H. Lutz. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 335–338*).—An analysis of records taken on the growth and fruiting of Schley pecan trees located in an orchard near Albany, Ga., which was 5 yr. of age at the beginning of the experiment in 1926, showed, upon adjustment of yields to the initial size of the trees, that over half the heretofore unexplained variation in tree yields was due to the variation in size of the trees at the beginning

of the study. Since some of the trees matured larger crops than others, and these higher producers were apparently trees of the larger initial size, there is a possibility that the limiting effect of cropping on growth has tended to mask, in part, the effects of initial size on subsequent growth. In fact, the data showed a much closer relationship between initial size and yield than between initial size and growth.

**Girdling to reduce fruit-drop in the Hachiya persimmon, R. W. Hodgson.** (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 405–409*).—Stating that it is not uncommon for vigorous young trees bearing a good crop to drop all their fruits prematurely, the author discusses the results of girdling experiments with young persimmon trees growing at Riverside, Calif. It was observed that girdling materially reduced fruit drop in the season of treatment and increased yields the succeeding season, apparently by increasing fruit-bud differentiation. Yields the third season were markedly reduced. The period from May 15 to June 15 was the safest and most effective time for girdling. Under the conditions the increased yield resulting from girdling was offset by smaller size and lower market quality resulting principally from sunburn.

**Defoliation of rose plants with ethylene gas, J. A. Milbrath, E. Hansen, and H. Hartman.** (Oreg. Expt. Sta.). (*Science, 91 (1940), No. 2352, p. 100*).—Stating that the use of ethylene for defoliating nursery rose plants has been accepted by Oregon growers, the authors discuss a procedure in which ripe apples were used as the chief source of ethylene gas. When a fairly airtight room was provided, 1 bu. of apples was sufficient for from 300 to 400 cu. ft. of space. A temperature of from 65° to 70° F. was maintained during the treatment. Where 50 percent or more of the space was occupied with rose bushes, the heat liberated by the plants, once the defoliation process was started, was adequate to maintain the necessary temperature. For most varieties, from 3 to 5 days was sufficient to complete removal of the leaves. The treatment had no apparent significant effect upon subsequent growth.

**Zinnia field trials, 1939, E. I. Wilde and C. B. Link** (*Pennsylvania Sta. Bul. 386 (1939), pp. [2]+21, fig. 1*).—Discussing the distinguishing botanical characteristics of the various types of zinnia, the authors present detailed descriptions of 194 samples representing most of the varieties found in American seed and nursery catalogs. The greatest variability was found in the large-flowered types, such as dahlia, California giant, and double giant. Rogues were found in most of the samples, indicating a lack of proper segregation of variety blocks in the seed fields.

**Pruning, care of shrubs injured by cold weather, F. S. Batson** (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 2, p. 6*).—Accompanying suggestions as to treatment of injured plants, data are presented on the behavior of numerous species.

**An illustrated guide to landscaping Mississippi homes, R. O. Monosmith and F. S. Batson** (*Mississippi Sta. Bul. 340 (1939), pp. 71, figs. 34*).—With the aid of designs and photographic illustrations, information is presented on the planning and arrangement of home grounds; the development of lawns; the construction of fences, walls, and garden pools; the use of garden furniture and accessories; the selection and utilization of plant materials, etc.

## FORESTRY

**[Forestry studies by the Arkansas Station], R. D. Stevens** (*Arkansas Sta. Bul. 386, pp. 85–88*).—Studies discussed include the relative efficiency of labor in portable sawmills; the operation of portable slack stave mills in cut-over bottom-land hardwoods; silviculture as a means of combating the locust

borer; lumber and nut production by the black walnut; growth rates of hardwood species; management of pine plantations on bottom lands; thinning of cottonwood stands; use of growth-promoting substances for rooting cottonwood cuttings; the effect of storage conditions and other treatments on the viability of cottonwood, oak, Kentucky coffee, and chestnut seeds; and the use of seed and cuttings for establishing cottonwood plantations.

**Progress of the Ohio Forest Survey,** O. D. DILLER. (Ohio Expt. Sta.). (*Bul. Ecol. Soc. Amer., 20 (1939), No. 4, p. 26*).—This is a discussion of the scope and nature of the activities, including aerial photography.

**High temperature tolerance of forest trees,** R. W. LORENZ (*Minnesota Sta. Tech. Bul. 141 (1939), pp. 25, pl. 1, figs. 3*).—Working with microscopic sections made from the seedlings of five forest species—*Pinus strobus, P. resinosa, Picea canadensis, Ulmus americana,* and *Catalpa speciosa*—the authors found that the several species did not vary greatly in their relative heat resistance. The cortical parenchyma cells of all five species were killed in 30 min. when exposed to temperatures between 57° and 59° C. (134.6° and 138.2° F.). One min. at from 65° to 69° was required to kill the cells. The Arrhenius formula gave $\mu$ values of 93,807, 91,651, and 132,000 for the heat killing of the cortical parenchyma cells in red pine, northern white pine, and catalpa, respectively. These values lie within the zone characteristic of heat coagulation. $Q_{10}$ values lying between 3.6 and 360 were obtained for the heat killing of cortical parenchyma cells in all 5 species studied.

**The water requirement of Rocky Mountain conifers,** J. ROESER, JR. (U. S. D. A.). (*Jour. Forestry, 38 (1940), No. 1, pp. 24–26*).—Measurements of water loss from containers filled with fine loam or Permian red sand and planted with seed or seedlings of various species of conifers indicated that Engelmann spruce, Douglas fir, piñon pine (*Pinus edulis*), ponderosa pine, and limber pine may be grouped in descending order of water requirement. Water losses from containers without plants were greatly less than from those containing plants. In relative efficiency of use of water in producing organic matter, the species ranked in decreasing order as follows: Piñon pine, Douglas fir, Engelmann spruce, and ponderosa pine, when grown on loam, and piñon pine and limber pine in Permian red sand.

**Evidences of racial influence in a 25-year test of ponderosa pine,** R. H. WEIDMAN. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 12, pp. 855–887, pls. 6, figs. 6*).—Observations on trees grown on the Kaniksu National Forest, Idaho, from seed collected in 20 localities representing wide differences in geographic location and in elevation revealed the existence of racial strains varying markedly in their rate of growth and hardness. Differences with respect to the number of needles per fascicle, length of needles, general appearance of foliage, and thickening of the hypoderm were observed among progeny groups derived from five different regions within the range of ponderosa pine in the United States which are delimited upon the basis of precipitation type. Differences among the progeny in the number of needles per fascicle, length of needles, general appearance of foliage, and rate of growth corresponded to the differences observed among the trees of the parent localities. The slowest-growing progenies made only one-half as much growth as did the fastest-growing. The best growth in height and diameter was made by trees derived from localities in the north plateau region resembling the locality of the planting site in climate. The poorest growth was made by trees from localities in Colorado, Utah, Arizona, and New Mexico which have more severe climates. Hereditary growth tendencies were less marked in the one progeny derived from a region having a climate

considerably milder than that of the experimental area. Characteristics as to the persistence of needles were not found to be inherited.

A study conducted cooperatively with the University of Montana revealed strong evidence that characteristics of the internal structure of the needles are inherited. The results indicate tentatively that the most suitable territory in which to collect ponderosa pine seed for planting in northern Idaho is that extending from the Colville locality in Washington, eastward a little beyond the Continental Divide, and from the Salmon River to the Canadian boundary.

**Vegetative competition as related to plantation success in the southern Appalachian spruce type,** L. S. MINCKLER. (U. S. D. A.). (*Jour. Forestry, 38 (1940), No. 1, pp. 68, 69*).—Observations in nine representative plantations of red spruce and four representative plantations of red pine showed that the degree of competition exercises a marked influence on the condition of the trees, which ranged in age from 2 to 7 yr. For example, only 20.1 percent of overtopped spruce trees were thrifty, as compared with 75 percent for trees free from competition. The mean height growths of overtopped, side competition only, and free red spruce trees were, respectively, 0.77, 1.21, and 1.25 ft. For red pine the figures were 0.61, 0.92, and 1.17 ft. Apparently not the identity but rather the degree of competition was the important limiting factor to successful growth.

**Survival in forest plantations in the northern Rocky Mountain region,** C. S. SCHOPMEYER. (U. S. D. A.). (*Jour. Forestry, 38 (1940), No. 1, pp. 16–24, figs. 3*).—A total of 1,150 plantations established in western Montana, northern Idaho, and northeastern Washington from 1910 to 1937 afforded a basis for valuable information as to factors affecting survival. That spring was a more favorable planting season than autumn was indicated in 7- and 10-percent higher survival for spring-planted western white and ponderosa pines, respectively, than for fall-planted trees. Preliminary observations indicated that early spring planting is better than delayed spring planting, as measured by survival. An analysis of first- and third-year survival data on plantations of various age classes of planting stock showed no significant differences between age classes of stock of either western white or ponderosa pine. The mean tenth-year survival percentage of 210 plantations distributed over the region on an aggregate area of 29,589 acres was 42.

**Tree losses in the mid-west United States during the drought of 1933–1939,** F. W. ALBERTSON and J. E. WEAVER. (Kans. State Col. and Univ. Nebr.). (*Bul. Ecol. Soc. Amer., 20 (1939), No. 4, p. 33*).—A period of exceptionally dry years covering the midwest United States began in the spring of 1933 and has continued up to the present time. This extreme drought has affected the whole of the Great Plains region and has even extended into the more humid region to the east. Tree growth gradually becomes more sparse and more dwarfed from the east to the west in this region. During the drought, many of the trees and smaller woody plants have been completely annihilated. Studies beginning before the drought and extending through it have been carried on by the authors of this report. This survey reached from Iowa to eastern Colorado. Most intensive study, however, centered around Lincoln, Nebr., and Hays, Kans. In many instances, the trees in hedgerows, windbreaks, farm woodlots, and farm ponds have suffered 100-percent loss. In some places, however, where the water table has remained near the surface of the soil, relatively small losses occurred.

**Defects which reduce quality and yield of oak-hickory stands in southeastern Iowa,** C. M. GENAUX and J. G. KUENZEL. (Coop. U. S. D. A.). (*Iowa Sta. Res. Bul. 269 (1939), pp. 405–444, figs. 13*).—Based on detailed studies of

753 trees representative of conditions encountered commonly in forests of southeastern Iowa, the report is made that volume loss from all types of defects averaged 8.5 percent of the total volume of trees in the merchantable size class, 5.2 percent of the total volume of large poles, and 6.2 percent of the total volume of saplings. In white oak, the most important species represented, the percentage of defective volume decreased with increasing diameter. Slightly over 60 percent of the trees were partially defective from one or more causes. In three out of every four defective trees the defects were evident only after felling and splitting. Over 90 percent of all trees had branch stubs larger than 0.5 in. in diameter, but only 11 percent of these were defective, probably because of the fact that the majority of the sample trees were of the younger age classes. Eight percent of all trees bore fire scars, and 50 percent of the scarred trees were defective. Most of the scars were found in trees of merchantable size. The oldest fire scar found in one of the larger trees dissected originated in 1847–48, and fires have occurred at irregular intervals from that date until the present time. Butt rot, transmitted from the parent stump, was found to be present in the young sprout growth and was less prevalent in the older sprout stands. *Stereum gausapatum*, isolated more than five times as often as any other fungus, was responsible for almost all of the basal rots of which the causal agent was identified. Sixty percent of all trees bore insect injuries, although the defects caused by insects averaged less than 2 percent of the total volume for all diameter classes. The authors present recommendations for the handling and care of woodlands.

**Effect of top pruning on survival and early growth of black locust,** H. G. MEGINNIS. (U. S. D. A.). (*Jour. Forestry, 38 (1940), No. 1, pp. 30–36*).—Stating that the cutting-back of the tops of black locust seedlings at planting or soon thereafter is often recommended, the author discusses the results of investigations in which 2-year-old trees were subjected to various top-pruning treatments. Severe pruning was found deleterious, regardless of season, and resulted in greater mortality and decreased growth. The author concludes that pruning of black locust planting stock is inadvisable except in the case of top-damaged and poorly formed trees.

**Black locust damaged by fire may be restored,** E. B. FERRIS (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 2, p. 6*).—Three-year-old locust trees were highly susceptible to a very light fire. However, when the injured trees were cut off at the soil level, 85 percent of the original trees developed strong sprouts.

**Taming our forests,** M. B. BRUÈRE (*U. S. Dept. Agr., Forest Serv., 1938, pp. V+87, figs. 48*).—Profusely illustrated, this pamphlet presents information in popular language relative to the importance of forests and their relation to public welfare, reforestation, propagation, control of fires and pests, the possible development of forestry in the future, etc.

**What forests give,** M. B. BRUÈRE (*U. S. Dept. Agr., Forest Serv., 1938, pp. VI+79, figs. 39*).—In the manner of the above, general information is presented on the products of the forests, including wood pulp, sugar, naval stores and tanning materials, the relation of forests to soil erosion and flood control, the value of forests from the recreational angle, etc.

## DISEASES OF PLANTS

**[Plant disease work of the Bureau of Entomology and Plant Quarantine]** (*U. S. Dept. Agr., Bur. Ent. and Plant Quar. Rpt., 1939, pp. 20, 21, 34–44, 53–57*).—Summary reports of progress are included on the control of peach mosaic

and phony peach diseases, citrus canker eradication, Dutch elm disease eradication, white pine blister rust control, and barberry eradication.

**The Plant Disease Reporter, [March 1 and 15, 1940]** (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 24 (1940), Nos. 4, pp. 74–106, figs. 3; 5, pp. 108–120, figs. 5*).—The following items of interest to phytopathology are included:

*No. 4*.—Virus diseases of the stone fruits, by K. S. Chester; notes on fruit diseases in the Ozark section of Arkansas in 1939, by J. C. Dunegan; a preliminary study of anthracnose spore load on cotton seed, by P. R. Miller; notes on black rot of kale in Virginia, by T. J. Nugent; and a contribution to the fungus flora of Nevada, by J. A. Stevenson and W. A. Archer.

*No. 5*.—Grass diseases occurring in the Pullman Nursery Unit of the Soil Conservation Nurseries, Pullman, Washington, during 1939, by G. W. Fischer; occurrence of bacterial ring rot on potato in Washington State, by G. A. Huber; some recent observations and reports on eelgrass wasting disease and re-establishment, in Maine, by F. H. Steinmetz and J. S. Gashwiler; and brief notes on *Sclerotinia* on cabbage in Georgia, damping-off in Georgia tobacco seedbeds, and *Botrytis* dry rot of gladiolus corms in New York.

**[Phytopathological studies by the Arkansas Station]** (*Arkansas Sta. Bul. 386 (1940), pp. 83–93.*)—Progress reports are given on a genetical, physiological, and pathological study of the cotton plant, with special reference to cotton wilt and the breeding of resistant varieties, by V. H. Young, E. M. Cralley, L. M. Humphrey, and W. H. Tharp; a physiological and pathological study of the biological strains of cotton-wilt fungi, by Cralley and Young; rice diseases, including seedling blights, by Cralley, longevity of sclerotia of the stem rot fungus and the effect of pH on stem rot development, both by Cralley and E. C. Tullis, and the effects of fertilizer and of irrigation methods on stem rot, both by Cralley; spraying for strawberry diseases, by Young and S. B. Locke; oat diseases, including the biology and control of crown rust and winter injury, by H. R. Rosen, L. M. Weetman, and C. K. McClelland, the genetics of resistance to crown rust, by Weetman, and the life history of *Puccinia coronata avenae*, by Rosen and Weetman; and the control of diseases of garden roses, by Rosen.

**[Plant disease work by the Delaware Station]** (*Delaware Sta. Bul. 220 (1939), pp. 33–35, 39, 40*).—Brief reports of progress are included on the causes, dissemination, and control of yellows and little peach, control of black rot and other sweetpotato diseases by chemicals, and breeding and selection of tomatoes resistant to disease, all by T. F. Manns; bacterial leaf spot of peaches, by Manns and S. L. Hopperstead; and copper sprays for the control of bitter rot on Lily of Kent apples, by K. J. Kadow, Manns, and Hopperstead.

**[Phytopathology studies of the Iowa Station].** (Partly coop. U. S. D. A.). (*Iowa Sta. Rpt. 1939, pt. 2, pp. 30–32, 40, 48–51, 54–62, fig. 1*).—Reports of progress are included on the development of laboratory technics for detecting seed-borne plant pathogens and field studies for comparing the germination of treated and untreated lots of sorghum and other field and vegetable crop seeds, by R. H. Porter; developing inbred lines of corn resistant to stalk and ear rots, by R. C. Eckhardt and A. A. Bryan; genetic investigations of bacterial wilt resistance in corn, including mutation in *Bacterium* (=*Phytomonas*) *stewartii*, by E. W. Lindstrom; physiological response of growing corn plants and pathogens to chemical treatments of the seed, by C. S. Reddy; the factors influencing resistance of corn strains to *Ustilago zeae*, by I. E. Melhus and G. Semeniuk; study of the *Diplodia zeae* dry rot of corn, by Melhus; pathogenicity of *Basisporium gallarum* to corn, by Reddy; disease resistance in corn

and the nature and methods of measuring it, including a method of inoculating *D. zeae* in the field, seedling resistance to *D. zeae* in the greenhouse, and physiological studies of *D. zeae* in relation to the relative resistance shown by different inbred lines of corn, by Semeniuk, Reddy, Melhus, W. E. Loomis, Lindstrom, and Bryan; and a plant disease survey of Iowa for the 1938 season, by Melhus, Reddy, and Porter.

**[Plant disease work by the New Mexico Station]** (*New Mexico Sta. Rpt. 1939, pp. 40, 41*).—Brief reports are included on the progress of work on the control of chlorosis; on root rots of alfalfa, trees, and shrubs; and on the segregation and evaluation of the factors contributing to the development of pink root and the associated bulb rot and false blight diseases of onions produced for seed.

**A list of important crop diseases occurring in Kiangsu Province (1934–1937)**, T. F. Yu (*Lingnan Sci. Jour., 19 (1940), No. 1, pp. 67–78*).—The diseases are listed under the 62 hosts included, both hosts and diseases being arranged alphabetically by common names. Localities are given for each disease listed.

**Losses to world agriculture through root disease of crops**, S. D. Garrett (*Chem. and Indus., 58 (1939), No. 43, pp. 953–958, figs. 4; also in Trop. Agr. [Trinidad], 17 (1940), No. 3, pp. 49–52*).—This is a general review, with presentation of outstanding examples and discussion of the production of disease-resistant varieties of crop plants, elimination of infectious material from the soil, plant sanitation, checking the underground activity and spread of the fungus, and increasing disease resistance of the host plant.

**A method of substituting pine sapwood for malt agar in culturing test fungi**, E. E. Hubert (*Science, 91 (1940), No. 2358, pp. 247, 248, fig. 1*).—The results of using Ponderosa pine sapwood as a medium for growing the wood-rotting and sap-staining fungi employed in testing the toxicity of preservatives in wood proved so consistently favorable and the reduction in time and the low cost of the materials was so encouraging that the method is here described and illustrated for trial and comment by other workers. For preliminary tests of new toxicants in wood, for testing sections cut from treated wood products to determine the effectiveness of the preservative treatment, and for testing the relative resistance of various species of wood to decay, this method has proved of value.

**The structure of the leaf galls of Plantago lanceolata L. induced by Anguillulina dipsaci (Kühn) Gerv. & v. Ben.**, J. B. Goodey (*Jour. Helminthol., 17 (1939), No. 4, pp. 183–190, figs. 4*).—In this study the normal and galled leaf structures are compared and illustrated. The tissues were found to change from abnormal to normal as the concentration of foreign substances diminished with distance from the focus of infestation. No zoning was noted. The "nutritive zone" may be excepted, since it is the focus of infestation. The only tendency of the host to form thickened tissue was seen in the presence of collenchyma, which occurs in normal leaves but in less amount. The extra development may be interpreted as a reaction to the parasite. Hypertrophy and proliferation occur when the "tone" of the plant is high, and wound cambial activity when the tone is low.

**Sectoring in colonies of Aplanobacter stewarti**, C. Elliott and A. L. Robert. (U. S. D. A.). (*Phytopathology, 30 (1940), No. 3, pp. 276–278, fig. 1*).—A single cell culture of *A. stewarti* (=*Phytomonas stewartii*) (No. 3b6) in a series of broth transfers and plantings developed large numbers of sectoring colonies. Some of the white and yellow sectors proved stable, whereas others continued to segregate for color. No evidence was obtained that any of the cultures from sectors was more virulent than the weakly virulent parent strain,

and all transfers from sectors gave the same alkaline reaction in litmus milk as the parent culture, 3b6.

**Plant responses to carcinogenic agents and growth substances, their relation to crown gall and cancer,** M. Levine (*Bul. Torrey Bot. Club, 67 (1940), No. 3, pp. 199–226, figs. 34*).—The author reports experiments over a 2-yr. period in which many plant species, principally *Kalanchoë*, *Bryophyllum*, sunflower, kidney bean, tobacco, and broccoli, were treated with carcinogenic hydrocarbons or other substances. Repeated treatments with indoleacetic acid alone or followed by vitamin $B_1$ were also made. Following decapitation, 1 percent scharlach red applied to the apical internode in *Kalanchoë* induced overgrowths resembling crown gall, while certain other carcinogenes induced necrosis of the treated zone. Roots subsequently appeared in the internodal spaces below the treated areas in *Kalanchoë*, while *Bryophyllum*, similarly treated, failed to produce roots. Indoleacetic acid in lanolin on decapitated and injured stems induced root formation. The stems cracked and small nodular masses were formed. Small overgrowths on decapitated *Kalanchoë* plants presented histological pictures identical with crown gall. Repeated treatments of sunflower or broccoli stems with indoleacetic acid alone or followed by vitamin $B_1$ induced raised overgrowths consisting of calloid structures made up of parenchymatous tissue as well as rootlike structures, but these treatments failed to induce excessive overgrowth. The fundamental difference between the heteroauxin-induced overgrowths and crown gall lay in the limited proliferative power of the former. The crown gall organism induces a variety of overgrowths, of which the globular type is most common, while leafy crown galls and those with roots represent other forms. The gall itself consists of parenchymatous tissue of the embryonic cell type. The longevity of this tissue is comparatively great and differentiation occurs over a long period, finally causing woody and corky tissue and death. No experimental evidence was found to show that the crown gall cell can proliferate in the absence of *Bacterium* (=*Phytomonas*) *tumefaciens*. Histologically, crown gall and some of the chemically induced overgrowths appear to be alike, but their gross morphological structures are widely different.

The reactions of plants to the crown gall organism and chemical agents are said to be protective mechanisms comparable only to inflammation in animals and man, while the proliferating power of cancer cells is limitless, resulting in invasion of normal tissue and metastatic secondary tumors. Transplantation of cancer tissue is possible for many transplant generations. The ability of these chemically induced reactions to transplant has not been tested. Crown gall tissue has limited transplantability, but the graft mechanism is complicated by the presence of *B. tumefaciens* in the inoculum.

**Sporangial proliferation in Peronospora tabacina,** F. A. Wolf and R. A. McLean (*Phytopathology, 30 (1940), No. 3, pp. 264–268, fig. 1*).—The author presents a brief account of sporangial proliferation in *P. tabacina* grown under conditions of high relative humidity and subdued illumination.

**Whence came Phytophthora infestans?** D. Reddick. (Cornell Univ.). (*Chron. Bot., 5 (1939), No. 4–6, pp. 410–412*).—The author presents evidence from which he concludes there are reasons for believing that *P. infestans* is enphytotic in Mexico only, and that it is desirable to make much more intensive study of the behavior of the parasite on Mexican solanaceous plants than on those of South America. Furthermore, the likelihood that infected tubers would be taken from Mexico to New England or to Europe is believed so remote that one is forced to suspect that Solanaceae other than the tuberous ones should be subjected to particular scrutiny.

**A nomenclatorial note on Pseudoperonospora,** G. R. HOERNER. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 30 (1940), No. 3, pp. 133, 134*).—*Pseudoperonospora cannabina, P. elatostemae,* and *P. portoricensis* are presented as new combinations by transfer from *Peronoplasmopara*.

**Three species of Pythium associated with root rots,** C. DRECHSLER. (U. S. D. A.). (*Phytopathology, 30 (1940), No. 3, pp. 189–212, figs. 8*).—Many zoosporangia of *P. dissotocum* were found to consist of completely undifferentiated filaments, while others included a number of somewhat distended lateral branches. They yielded enormous numbers of zoospores, often much given to iterant swarming. In its sexual apparatus are revealed some antheridial relationships familiar in *P. debaryanum* and *P. ultimum*. *P. periilum* displayed swollen elements more abundantly in its zoosporangia than *P. dissotocum*. Its oogonium was extensively and closely inwrapped by a branching antheridial filament, much like the oogonia of *P. scleroteichum* and various terrestrial species of *Aphanomyces*. *P. paroecandrum* produced subspherical zoosporangia like those of *P. debaryanum*. As is implied in the specific name, its antheridia often arise in close proximity to the oogonium. Thus, in arrangement of sexual apparatus, the species greatly resembles *P. ultimum*, although the oospore has an internal organization more suggestive of *P. debaryanum*.

**Some effects of strains of cucumber virus 1 in lily and tulip,** P. BRIERLEY and S. P. DOOLITTLE. (U. S. D. A.). (*Phytopathology, 30 (1940), No. 2, pp. 171–174, figs. 2*).—Strains of cucumber virus 1 induced no symptoms in *Lilium longiflorum* seedlings but were recovered. The strong mottle virus (tulip group) induced symptoms in this species but did not infect Turkish tobacco. Necrotic-fleck symptoms developed in *L. longiflorum* when a cucumber virus 1 strain was introduced into plants already carrying McWhorter's latent virus of lily. Celery and lily strains of cucumber virus 1 were introduced into Clara Butt tulips and recovered, producing symptoms distinguishable from typical breaking in the variety.

**Prevalence of cucumber and tulip viruses in lilies,** P. BRIERLEY. (U. S. D. A.). (*Phytopathology, 30 (1940), No. 3, pp. 250–257, figs. 2*).—Parallel inoculations of virus from *Lilium longiflorum* to tulip and to *L. formosanum* indicated that the last detects tulip virus, including McWhorter's latent virus. Using *L. formosanum* as a test plant for tulip virus and tobacco for cucumber virus, the author showed that both occur in garden lilies. Tulip virus was detected in 31 species or varieties of lilies out of 41 indexed, and from 13 localities out of 15 sampled. Cucumber virus was found in 18 species or varieties from 9 localities, but was not detected in 22 collections from 6 localities in the western United States. *L. tigrinum* was found apparently healthy in isolated gardens. No virus was detected in 9 tests of *L. hansoni* from 5 localities, and this species thus appears either resistant or disease-escaping. Lily seedlings isolated from mosaic lilies have escaped virus infection in trials of 1–2 yr. duration.

**An attempt to propagate tobacco-mosaic virus 1 in the chorio-allantoic membrane of the developing chick embryo,** W. N. TAKAHASHI. (Univ. Calif.). (*Phytopathology, 30 (1940), No. 2, pp. 184, 185*).—The chorioallantois of fertile incubated hens' eggs (Burnet's modification of Woodruff and Goodpasture's method) was inoculated with purified and filtered tobacco mosaic virus 1 and subplanted four successive times. Under the conditions, not only did the virus fail to multiply but active virus could not be detected (*Nicotiana glutinosa* local-lesion method) in the membrane on which the original inoculation had been made.

**Carborundum for plant-virus inoculations,** T. E. Rawlins and C. M. Tompkins. (Univ. Calif.). (*Phytopathology, 30 (1940), No. 2, pp. 185, 186*).—The authors describe in detail the carborundum powder used in virus inoculations.

**Comparative susceptibility of crop plants to sodium chlorate injury,** A. M. Hurd-Karrer (*U. S. Dept. Agr., Tech. Bul. 648 (1940), pp. 15, pls. 2, figs. 2*).—Tested by adding sodium chlorate to soil in the greenhouse, barley, sunflower, and spinach proved most sensitive to injury, while oats and flax were most tolerant of the crops used. Tolerance of the last, however, was greatly reduced by low temperatures. Of the small grains, wheat came next to oats in tolerance, rye was definitely less tolerant than wheat, and barley was most susceptible of all. Of the sweet sorghums, Sumac and Black Amber were most susceptible. Sweetclover was usually more tolerant than alfalfa. Winter rape was sometimes resistant, but low temperatures greatly reduced its tolerance. Soybean appeared resistant in its early growth stages but failed strikingly later. The comparisons noted were based on green weights of the injured plants, expressed as percentages of the weights of equal numbers of control plants, which seemed to give the most significant measurement of relative injury. Injury was greater at low (10°–15° C.) than at high temperatures (20°–25°), this effect being more pronounced with some crops (e. g., Hannchen barley and winter rape) than with others. Variations in age and in rate of development under different environments also affect the relative tolerance to sodium chlorate.

**Injury to trees from sulfur dioxide fumes of electric refrigerators,** M. A. McKenzie and L. H. Jones. (Mass. Expt. Sta.). (*Science, 91 (1940), No. 2358, pp. 239, 240*).—This note reports injury to lawngrass and to leaves of trees and shrubs by $SO_2$ gas escaping from a defective electric household refrigerator.

**The trend of progress: Fungicides,** H. Martin (*Chem. and Indus., 58 (1939), No. 27, pp. 641–643*).—A review of progress (11 references) in the development and use of fungicides containing sulfur, copper, mercury, formaldehyde, or a few less widely used materials as the active constituents.

**Volatile fungicides, benzol and related compounds, and the principles involved in their use,** F. A. Wolf, R. A. McLean, J. A. Pinckard, F. R. Darkis, and P. M. Gross. (Va. Expt. Sta. et al.). (*Phytopathology, 30 (1940), No. 3, pp. 213–226, figs. 5*).—During some seasons benzol need not be applied nightly to secure tobacco downy mildew control or to give complete protection against it. The length of the interval necessary between applications is probably governed by the length of the sporangial cycle and by modificatory effects of the weather. Cotton balls dipped into benzol proved effective for vaporization in the seedbeds. Exposing tobacco seedlings to vapors of benzol and paradichlorobenzene increased the permeability of the plasma membranes. Concentrations of 1/16 saturated benzol, 1/2 saturated paradichlorobenzene, 1/750 saturated phenol, and 1/75 saturated aniline closely approximated the minimum toxic limits for inhibiting sporangial germination in *Peronospora tabacina*. The principles involved in using volatile fungicides are briefly discussed in relation to their possible mode of action and to seedbed practice.

**The fungistatic and fungicidal action of certain organic sulphur compounds,** E. L. Everitt and M. X. Sullivan (*Jour. Wash. Acad. Sci., 30 (1940), No. 3, pp. 125–131*).—The fungistatic and fungicidal action of ±50 sulfur compounds were tested, using *Fusarium oxysporum*, *F. lycopersici*, *Aspergillus fumigatus*, *A. niger*, and the *Penicillium* of Fleming as test organisms. Fungistatic activity was manifested by phenylthioarsenite, 4-chloro-2-nitrophenyl sulfur amine, 1,2 naphthoquinone-4-sodium sulfonate, and Prontylin or sulfanilamide,

and fungicidal activity by phenylbenzothiazole and mercaptobenzothiazole. The last, a cheap and readily available compound, proved the most effective, inhibiting mold growth at 50–100 p. p. m. Since this study dealt only with in vitro tests, no conclusion as to therapeutic applications can be drawn. Preliminary tests on guinea pigs indicated mercaptobenzothiazole to have little if any toxicity.

**Home made yellow oxide of mercury on bentonite for Rhizoctonia control,** R. H. DAINES and W. H. MARTIN (*N. J. State Potato Assoc., Hints to Potato Growers, 20 (1940), No. 9, pp.* [*1–3*]).—Mixing yellow oxide of mercury with bentonite is reported to have improved the sticking power and resistance to settling out of the fungicide, as shown by successful field and greenhouse tests for the control of *Rhizoctonia* on seed potatoes.

**Selenized soil as a control for aphids and red spiders on sorghum in the greenhouse,** R. W. LEUKEL. (U. S. D. A.). (*Phytopathology, 30 (1940), No. 3, pp. 274–276, fig. 1*).—When sodium selenate at the rate of 2–4 p. p. m. was applied to Keyport clay loam in the greenhouse, damage to sorghum by red spiders and aphids was effectively prevented, but stronger concentrations injured the plants. Due to its extremely poisonous nature, selenium is recommended for this purpose only in experimental work.

**The snow molds of grains and grasses caused by Typhula itoana and Typhula idahoensis,** R. E. REMSBERG. (Cornell Univ.). (*Phytopathology, 30 (1940), No. 2, pp. 178–180*).—These Typhulas were definitely associated with snow molds of cereals and grasses. The most common species in the United States, Europe, and Japan is *T. itoana*, frequently designated as *T. graminum* or *Sclerotium fulvum*. *T. idahoensis*, often collected in the western United States, is probably the species described in Sweden as *T. borealis*. It is possible that a third species, *T. graminum*, may be associated with snow molds, but it has not yet been demonstrated. These conclusions are based on morphologic studies of sporophores and sclerotia and careful comparisons with authentic herbarium materials.

**Fundamental studies of the stripe smut of grasses (Ustilago striaeformis) in the Pacific Northwest,** G. W. FISCHER. (U. S. D. A. and Wash. Expt. Sta.). (*Phytopathology, 30 (1940), No. 2, pp. 93–118, figs. 4*).—Spores of a new race of *U. striaeformis* from species of *Agropyron* and *Elymus* in the Pacific Northwest proved capable of immediate germination without an after-ripening period and remained viable for several months. In germination 2–3 thick germ tubes emerge, rapidly elongate, and develop cross walls and branches. An abundance of typical elliptical sporidia are budded from this promycelium and are capable of rapidly developing into large colonies on agar media. This is said to be the first report of any kind of saprophytic existence for *U. striaeformis*. The sporidia represent one or the other of two sex groups. When those of opposite sex are mixed, especially on nonnutrient agar, they fuse within a few hours, and from each fused pair a long, vigorous, aerial infection hypha arises. The sporidia also fuse readily with other species of *Ustilago*, although some combinations with other species are far more productive of infection hyphae than others. For the first time, it is believed, *U. striaeformis* has been cultured artificially, excellent growth being easily obtained on a variety of media but with the best growth on 2 percent agar plus 8 percent dextrose, 4 percent malt extract, and 1 percent peptone. Inoculations by the partial vacuum method were highly successful, using aqueous suspensions of either spores or sporidia of opposite sex. In greenhouse or field tests, high percentages of infection resulted on species of *Agropyron*, *Elymus*, *Hordeum*, and *Sitanion*, smut sori beginning to appear within 6 weeks after seeding. Inoculations have added 6 new hosts, *A. smithii*, *A. subsecundum*, *E. canadensis robustus*, *E. sibiricus*, *H. jubatum*, and *H. nodosum*, bringing the total

to 43 species in the United States. This new race is apparently seed-borne, such evidence not previously having been presented for the species. Most of 34 selections and collections of slender wheatgrass proved to be quite susceptible, and only 6 appeared promising as resistant or immune stock. In keeping with previous usage, this new race is designated *U. striaeformis* f. *hordei*. There are 3 references.

**Physiologic races of Ustilago hordei (Pers.) K. and S. in Alberta**, W. SEMENIUK (*Canad. Jour. Res., 18 (1940), No. 3, Sect. C, pp. 76–78*).—The pathogenicity of 4 collections of *U. hordei* on 4 barley varieties was determined in 3 seasons (1935, 1937, and 1938). The studies in 1935, involving 12 collections indicated that the 4 used in the present investigation represented distinct physiologic races. The distinctions among them appeared to be substantiated in 1937, but the results in 1938 were conflicting. One race was clearly distinct from the other 3, but the cause of the erratic behavior of the latter group from year to year was obscure.

**Foot rots and root rots of small grains in Oregon**, R. SPRAGUE. (Coop. U. S. D. A.). (*Oregon Sta. Cir. Inform. 207 (1939), pp. 6*).—The more important soil-borne root and foot rot diseases of cereals in Oregon are tabulated and briefly discussed, and keys for their identification are provided.

**Correlated inheritance in oats of reaction to smuts, crown rust, stem rust, and other characters**, J. H. TORRIE. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 11, pp. 783–804, figs. 5*).—The author studied the mode of reaction of several oat crosses to a mixed inoculum of *Ustilago avenae*, *U. levis*, *Puccinia coronata*, and *P. graminis avenae*, while the inheritance of several kernel characters and earliness and their relation to disease reaction was investigated in the Iowa No. 444 × Bond cross. The $F_3$ distributions for percentage of smutted plants indicated that two factor pairs, one a factor for high resistance and the other for partial resistance, govern the inheritance of smut reaction. The segregation for crown rust reaction in the Iowa No. 444 × Bond cross suggested the presence of two factor pairs, *S* a factor for crown rust resistance and *I* a factor partially inhibiting the expression of *S*. The masking effect of this inhibitor on *S* proved greater in the mature plant stage in the field than in the seedling stage in the greenhouse. The segregation obtained with individual races of *P. coronata* was essentially like that secured when a composite inoculum was used. The $F_1$ seedling reaction indicated a partial dominance of resistance to *P. coronata*, whereas the mature plant reaction in the field exihibited a partial dominance of susceptibility. In general, the agreement of seedling with mature plant reaction was close. A single factor pair governed the expression of stem rust reaction, resistance being dominant over susceptibility. There was a very close agreement of seedling with mature plant reaction. In the Iowa No. 444 × Bond cross the characters basal hair length and number, basal articulation, and rachilla attachment were monogenic in inheritance, while the characters, lemma color, awning, and ratio of kernel width to length were digenic. Linkage occurred with all the kernel characters studied. A partial dominance of earliness was found. Significant positive and negative simple correlation coefficients were noted between days from emergence to heading correlated, respectively, with days from emergence to maturity and fruiting periods in days. Smut and crown and stem rust reaction were inherited independently of one another and of the characters earliness, basal articulation, and basal hair length for the Iowa No. 444 × Bond cross.

**A machine for controlling loose smut in wheat and barley**, K. S. CHESTER (*Oklahoma Sta. Cir. 86 (1940), pp. 8, figs. 3*).—The construction, cost, and use of an apparatus said to make seed treatment easier and more effective are described, and the machine is illustrated.

**The relation of temperature to common and halo blight of beans,** R. W. Goss. (Nebr. Expt. Sta.). (*Phytopathology, 30 (1940), No. 3, pp. 258–264, fig. 1*).—The amount of infection by common blight (*Phytomonas phaseoli*) under controlled conditions was not influenced by temperatures between 16° and 32° C., but the incubation period was 27 days at 16° as contrasted with 7 days at 32°. When infected but symptomless plants were transferred from low to high temperatures, symptoms developed rapidly. The incubation period of halo blight (*P. medicaginis phaseolicola*) was not influenced by temperatures between 12° and 32°; but the lower temperatures favored halo formation, whereas the higher temperatures resulted in small, inconspicuous spots. The oldest leaves of young plants were more susceptible to common blight infection than the young leaves just unfolding, while the reverse was true of halo blight. Very little infection of primary leaves occurred with halo blight, while with common blight they were seriously infected. The relative humidity after a 24-hr. incubation period at high humidity had no appreciable effect on halo blight, but low humidities increased the severity of symptoms with common blight.

**Root-knot resistance in beans,** K. C. Barrons. (Ala. Expt. Sta.). (*Jour. Hered., 31 (1940), No. 1, pp. 35–38, fig. 1*).—It is concluded from the results of this study that resistance to *Heterodera marioni* in Alabama No. 1 bean is inherited as a double recessive trait. It is also deemed probable that the inheritance is on a quantitative basis, with all individuals possessing 2 or more dominant genes appearing susceptible to root knot and those with 1 dominant gene appearing intermediate. An $F_2$ segregation or ±11 susceptible: 4 intermediate: 1 resistant was obtained.

**Relative susceptibility of celery varieties to Fusarium yellows in Ohio,** J. D. Wilson (*Ohio Sta. Bimo. Bul. 202 (1940), pp. 7–15*).—Losses from *F. apii* yellows in Ohio are reported to have been increasing in recent years, growing of many self-blanching celery standard varieties having been discontinued on account of this disease. In order to classify the available market varieties on the basis of susceptibility to yellows, early and late plantings of varieties, selections, and hybrids were made in each of 5 highly infested fields during 3 seasons, 71 having now been tested. They are classified not only on the basis of yellows resistance but also according to their ability to grow and attain marketable size in fields contaminated with the *Fusarium* as well as with other organisms and toxins of harmful nature that may be expected to accumulate under continuous celery culture. Notes are also included on the relative incidence of early blight on all the varieties tested.

"Easy Blanching, Crispheart, Full Heart, Woodruff's Beauty, Autumn King, and Winter King (all of which are green) were found to be highly resistant to yellows in these trials and should mature good stands even in highly infested fields. Another group, which includes both yellow and green varieties, furnishes a choice of certain self-blanching varieties that may be used if a yellow celery is desired. . . . A high degree of susceptibility to yellows was usually accompanied by poor growth. The amount of growth made by different varieties in the moderately susceptible group varied widely and without particular reference to the amount of disease as indicated by the percentage of loss. It was indicated, therefore, that other factors besides the yellows disease might be antagonistic to good growth. Full Heart, Pride of the Market, Newark Market, Golden Plume Tall, and Golden Plume Special were varieties which grew especially well in most of the test fields."

**Invasion of sweet-corn plants of different ages by strains of Phytomonas stewarti,** G. L. McNew (*Phytopathology, 30 (1940), No. 3, pp. 244–249, figs. 2*).—Virulent strains of *P. stewartii* proved as invasive on young as on more mature

sweet corn plants. Weakly virulent strains, on the other hand, were much more invasive on plants over 14 days old than on younger plants. These isolates differed from the highly virulent one in that they were unable to utilize inorganic nitrogen. Since this property is a limiting factor in the virulence of *P. stewartii* for young seedlings, the theory is advanced that corn plants begin to synthesize organic nitrogenous materials as they pass the seedling stage and that some of these materials reach the tracheal sap, there serving to nourish the weakly virulent bacterial strains.

**Sweet corn wilt tests, 1939** (*New Jersey Stas. Plant Disease Notes, 17 (1939), No. 7, pp. 24–28*).—The detailed results are reported of tests conducted in 1939 with 48 yellow sweet corn varieties and hybrids at the college farm to determine relative resistance to bacterial wilt and also to smut. The general results of tests in several commercial fields are also given. Remarkable differences in incidence of wilt were found in some instances, depending on the specific location in the field. The corn flea beetle was more prevalent in the areas where wilt became most severe. Although neither smut nor wilt was very severe on the college farm, enough was present to make comparisons possible.

**Preliminary serological studies of Phymatotrichum omnivorum**, R. W. Cumley and G. W. Goldsmith (*Phytopathology, 30 (1940), No. 2, pp. 130–139*).—This study was initiated to determine the relationship of the cotton root-rot fungus to various members of other fungus groups. Extracts of freshly collected or cultured species were compared with the root-rot fungus by the precipitin and complement-fixation tests, the results indicating *Phymatotrichum* to be more closely related serologically to the various Gasteromycetes than to any of the other fungi tested.

**Horse radish troubles** (*New Jersey Stas. Plant Diseases Notes, 17 (1939), No. 8, pp. 29–32*).—An informational circular on white rust, crown rot, rough bark, and leaf spot of horseradish and their control.

**Bacterial wilt of lespedeza**, T. T. Ayers, C. L. Lefebvre, and H. W. Johnson (*U. S. Dept. Agr., Tech. Bul. 704 (1939), pp. 23, figs. 13*).—A bacterial wilt of annual lespedeza (*Lespedeza stipulacea* and *L. striata*) is described and shown to be due to *Phytomonas lespedezae* n. sp., the early Korean lespedeza strain F. C. No. 19604 proving especially susceptible. Other strains of annual lespedeza inoculated also proved susceptible, but only light infection was obtained in Standard Korean (F. C. No. 22457) and one strain of Common (F. G. No. 22590). The disease has not been observed on perennial lespedeza species in the field, but greenhouse inoculations have shown several of them to be susceptible, though only very localized infection and no necrosis followed inoculations to other genera of legumes. The organism persisted from summer to the following spring in diseased plant trash overwintered at Arlington, Va. It may also occur either in or on the seed of Early Korean lespedeza, and this may be another mode of overwintering as well as a method by which the organism may be carried to new fields. There appear to be no practical control measures for checking the spread of the disease once it appears in a field. The development of an early strain resistant to wilt may eventually prove necessary for control in the northern portion of the area in which the annual lespedezas have become an important forage crop.

**Methods of value in breeding Austrian winter field peas for disease resistance in the South**, J. L. Weimer. (Ga. Expt. Sta. and U. S. D. A.). (*Phytopathology, 30 (1940), No. 2, pp. 155–160, figs. 3*).—Electrically heated and controlled hotbeds covered with heavy cloth were found to prevent freezing of English peas being tested for resistance to *Ascochyta pinodella* and *Mycosphaerella pinodes* during winter and spring at Experiment, Ga. Austrian winter peas and many other field and garden varieties set seed satisfactorily out

of doors under cheesecloth, but not otherwise. During the spring and fall, 500-w. electric lamps were suspended over the plants and kept lighted from 5 to 11 p. m. each day. Two crops of seed a year were grown by the method outlined. An epidemic of the diseases being studied was produced by pure-culture inoculations of hotbed-grown potted plants.

**The role of insects in the dissemination of potato blackleg and seed-piece decay,** R. BONDE. (Maine Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *59* (*1939*), *No. 12, pp. 889–917, figs. 9*).—In Maine and South Carolina studies to determine the role of insects in disseminating blackleg and seed-piece decay in potatoes, and the factors influencing insect attack and the consequent disease development, many associated species were found. Most of these insects proved to be merely scavengers, but the seed-corn maggot (*Hylemyia cilicrura*) and the seed-potato maggot (*H. trichodactyla*) may attack planted potato seed pieces and introduce bacteria which may induce blackleg and seed-piece decay. Laboratory and field studies indicated that these insects are attracted to bacterial lesions on the cut surfaces of seed pieces. These lesions may result from soil contamination of unsuberized seed pieces, or to any contamination of lesions due to excessive drying before planting or to fertilizer injury. These insects were not attracted to fungus lesions and rarely attacked healthy seed pieces. Suberization of seed pieces before planting prevented formation of bacterial lesions and aided in controlling maggot injury. The soft rot organism *Erwinia carotovora*, as well as other pathogenic bacteria, were intimately associated with the different life cycle stages of each of the two anthomyiids studied, the bacteria apparently having a role in their normal development. Staphylinids, found associated with diseased potatoes, may also possibly aid in disseminating blackleg and seed-piece decay in Maine. There are 17 references.

**Potato seed-piece rot caused by Fusarium oxysporum,** A. H. EDDINS. (Fla. Expt. Sta.). (*Phytopathology, 30* (*1940*), *No. 2, pp. 181–183, figs. 2*).—Inoculations proved *F. oxysporum* isolated from decaying seed pieces to be pathogenic and responsible for a seed piece decay at Hastings, Fla., in many fields within 2–3 weeks after planting.

**A dry rot of potato stems caused by Fusarium solani,** R. W. GOSS. (Nebr. Expt. Sta.). (*Phytopathology, 30* (*1940*), *No. 2, pp. 160–165, fig. 1*).—Stem and soil inoculations with a strain of *F. solani* were found to cause a dry, shredded rot of the underground stem and a rot of the roots, with rosetting, aerial tuber formation, leaf purpling, and wilting as accompanying symptoms. The strain was less virulent than *F. solani eumartii* but more so than *F. oxysporum* or *F. avenaceum*. Tuber infection via the stolons did not occur, but a tuber rot resulted from wound inoculations. Growth in culture was favored at 30° C. Other potato isolates, morphologically similar to *F. solani*, and a strain from squash proved nonpathogenic on potato plants and only weakly so on the tubers.

**Bacterial ring rot, a new potato disease,** W. E. BRENTZEL (*North Dakota Sta. Bimo. Bul., 2* (*1940*), *No. 3, pp. 12–14, figs. 3*).—It is reported that bacterial ring rot of potatoes was found in a number of North Dakota fields last year and in 27 or more different States. This note briefly describes and illustrates the disease, and gives precautions for its control.

**Report on potato bacterial ring-rot** (*U. S. Dept. Agr., Ext. Path. No. 40* (*1940*), *pp. 12, fig. 1*).—This is a digest of research and a summary of the present known distribution of this disease, with a report of the committee to coordinate research on new and unusual potato diseases.

**Relation of stomata to infection of tobacco leaves by Bacterium tabacum,** S. DIACHUN. (Ky. Expt. Sta.). (*Phytopathology, 30* (*1940*), *No. 3, pp. 268–272, figs. 2*).—When tender leaves with closed stomata on vigorous tobacco

plants were atomized with *B. tabacum* (=*Phytomonas tabaci*) they developed but little infection, whereas similar leaves with open stomata became severely infected. During some rain storms the stomata are open and during others they are closed, depending perhaps on light intensity. It is suggested that natural infection by bacteria carried in wind-blown rain may occur only when the stomata are open.

**[Papers on sugar beet diseases and their control]** (*Amer. Soc. Sugar Beet Technol., East. U. S. and Canada, Proc., 1 (1939), pp. 13–23, 25–27*).—The following papers are included: Dusting and Spraying Sugar Beets, by H. C. Young (pp. 13–16) (Ohio Expt. Sta.); Dusting and Spraying, by L. W. Esckilsen (pp. 16–20); Report on Dusting Sugar Beets in 1938 in the Decatur Territory, by J. W. Calland (pp. 20–23); and Results of Variety Tests, Including Blight Resistant Strains in Five Plant Areas, by M. W. Sergeant (pp. 25–27).

**Controlling tobacco downy mildew (blue mold) with paradichlorobenzene,** W. B. Tisdale and R. R. Kincaid (*Florida Sta. Bul. 342 (1939), pp. 16, figs. 6*).—The paradichlorobenzene vapor treatment is said to have proved highly effective for downy mildew, simple and comparatively inexpensive, and usable during rainy weather when treatment is most needed. Narrow beds (±6 or 9 ft. wide) are recommended, and with this treatment it is deemed necessary to plant only the regular yardage of bed area. Full directions for bed construction and carrying out the treatment are given.

**Tobacco mosaic and its control,** J. Johnson and W. B. Ogden. (Coop. U. S. D. A.). (*Wisconsin Sta. Bul. 445 (1939), pp. 22, figs. 8*).—The symptoms, cause, and control of tobacco mosaic are discussed from the standpoint of present knowledge. Its control depends on preventing the plants in the seedbed and field from becoming contaminated with virus-infected material from previous crops. This source of infection may be in infested soil and field refuse, refuse from harvested tobacco, manufactured and "natural" leaf tobacco used by workers on the crop, and certain other plants susceptible to the disease, such especially as tomatoes. Growers are cautioned to familiarize themselves with the disease, the sources of infection and manner in which it spreads, and then to give attention to such preventive measures as may apply to their particular situations.

**The Chilean tomato, Lycopersicon chilense, found resistant to curly top,** W. J. Virgin. (Univ. Idaho). (*Phytopathology, 30 (1940), No. 3, p. 280*).—Beet leafhoppers were caged with two specimens of *L. chilense* and two Earliana tomato plants in the greenhouse and removed after 48 hr. The Earliana plants became severely affected with curly top and died, whereas the *L. chilense* plants remained normal. In a second test, *L. chilense* plants were grown in the field and beet leafhoppers fed on diseased sugar beets were caged on three of them for several days. No symptoms developed, and the plants grew luxuriantly throughout the season. There was no spontaneous infection on them such as occurred on common tomatoes growing in the same field.

**Studies on Fusarium wilt of the tomato.—I, Immunity in Lycopersicon pimpinellifolium Mill. and its inheritance in hybrids,** G. W. Bohn and C. M. Tucker (*Missouri Sta. Res. Bul. 311 (1940), pp. 82, figs. 9*).—Seedling and field tests of several wilt-resistant commercial tomato varieties indicated that their resistance to *F. lycopersici* is ineffective under conditions very favorable to wilt development. All accessions of cultivated or wild *L. esculentum* were in some degree susceptible, whereas all species of other solanaceous genera tested were immune. Tests of accessions of *L. pimpinellifolium* exhibited varying degrees of reaction, but one of them (No. 160) possessed a degree of resistance approaching immunity which was maintained in greenhouse and field tests from 1935 to 1939 under conditions resulting in almost universal infection of

resistant commercial tomatoes. Attempts to induce wilt in Accession 160 by injecting fungus suspensions and by inoculations with 39 virulent isolates of the pathogen from various regions and varieties were unsuccessful. $F_1$ hybrids between this accession and susceptible varieties proved immune. Tests of 1,784 individuals from flowers of $F_1$ hybrids pollinated from commercial varieties yielded 854 suscepts and 930 immunes, and second backcrosses from similar pollinations tested under very favorable wilt conditions segregated 458 suscepts and 461 immunes, showing that immunity depends on a single dominant factor. Further experiments demonstrated that the potency of this immunity factor is not decreased in association with large numbers of genetic factors from commercial varieties. $F_2$ progenies and first backcrosses to commercial varieties with pollen of hybrids segregated proportions of suscepts smaller than would be expected on the basis of single factor inheritance. Data on $F_2$ progenies from the original cross, second backcrosses from flowers pollinated with pollen of hybrids, and first, second, and third self-progenies from successive backcross selections showed that the gene for immunity is linked with a factor influencing the effectiveness of the microgamete. Selections in successive generations among plants grown in steamed, infested greenhouse soil and inoculated at transplanting in the field yielded plants homozygous for the immunity factor and bearing medium-large fruits of good quality, but these plants were not homozygous for fruit and plant characters.

**Spray suggested to control destructive tomato disease,** J. A. CAMPBELL (*Miss. Farm. Res. [Mississippi Sta.], 3 (1940), No. 2, p. 6*).—This note sets forth instructions for a trial spray program against tomato blight, based on observations made at the Truck Crops Substation and other stations.

**Resistance to clubroot in varieties of turnip and rutabaga,** J. C. WALKER. (U. S. D. A. and Univ. Wis.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 11, pp. 815–827*).—A review of the literature (38 references) on *Plasmodiophora brassicae* and an outline of results in the development of resistant varieties in the United States and Europe are presented. The study is concerned with the range of resistance in varieties of turnip and rutabaga in use in the United States. Tabular results are given of field trials at Madison and in Racine County, Wis. (1932–34), and greenhouse trials (1935–37) using Racine County soil as inoculum. An additional table outlines the results of greenhouse trials on 2 turnip varieties with inocula from 7 States and on 1 rutabaga variety with inocula from 2 States. Of the turnip varieties subjected to the 2 Wisconsin inocula, a number remained disease-free in all trials, a few showed 10 percent infection or less, a number 30 percent or over, and Di Rapi and Shogoin 80 percent or more in all but 1 trial. Results with turnips agree essentially with previous findings, except that certain varieties susceptible elsewhere remained disease-free in infested Wisconsin soils. Rutabagas exposed to Wisconsin inocula remained disease-free in most varieties while others showed slight infection. When subjected to inocula from other States, Shogoin turnip was highly susceptible, Snowball turnip was infected in only 2 cases, and American Purple Top rutabaga was infected by New Jersey inoculum but showed no infection in infested New York soil. The lack of conformity of host reaction in the United States and Europe is believed to indicate that the pathogen consists of more than 1 physiologic race.

**Apple dieback in California,** P. A. ARK and H. EARL THOMAS. (Univ. Calif.). (*Phytopathology, 30 (1940), No. 2, pp. 148–154, figs. 2*).—Dieback of apple trees, often accompanied by a type of "measles" and occasionally by cork and drought spot of the fruit, is said to be prevalent in the Sebastopol area of California where the soil is distinctly acid and low in available nutrients.

particularly potassium. Grown in soil from affected orchards, such annuals as nasturtium, sugar beet, and sunflower developed boron-deficiency symptoms curable by adding small amounts of borax or boric acid to the soil. Some benefit seemed apparent from applications of boron to apple trees with cork and measles and to some with dieback symptoms only. Applications of $K_2SO_4$ in two orchards with dieback gave considerable improvement in one and only slight in the other. The experience to date is on the whole believed to suggest that in some, if not all, of the orchards under study more than one element may be involved in the production and control of dieback.

**A white root rot of apple trees caused by Corticium galactinum,** J. S. Cooley and R. W. Davidson. (U. S. D. A.). (*Phytopathology, 30 (1940), No. 2, pp. 139–148, figs. 4*).—This disease is said to occur in the Middle Atlantic and the midwestern fruit regions of the United States. The proportion of affected orchards was not found to be large, and where present the disease was observed near woods or on newly cleared land. This root rot does not appear to spread rapidly from tree to tree, but affected trees succumb rapidly. Inoculations were successful, using basidiospore cultures of *C. galactinum*. A number of other plant species were found diseased when present near infection foci.

**Development of scab on stored apples, 1938–1939,** C. O. Bratley. (U. S. D. A.). (*Phytopathology, 30 (1940), No. 2, pp. 174–178, fig. 1*).—An outbreak of *Venturia inaequalis* infection on stored apples grown in the northeastern United States was correlated with a 10-day rainy period preceding the 1938 hurricane. Apples harvested after that date generally became scabby, whereas those picked earlier remained scab-free.

**Corticium areolatum, the cause of the areolate leaf spot of citrus,** G. Stahel (*Phytopathology, 30 (1940), No. 2, pp. 119–130, figs. 7*).—This is a very troublesome wet-weather leaf spot prevalent from Brazil to Venezuela, and especially on sour orange nursery stock. *Leptosphaeria bondari* was formerly (1935) supposed to be the cause. The disease is here shown to be due to *C. areolatum* n. sp. In wet weather the mycelium grows out from the margins of the zonal dead spots and spreads as a mildewlike whitish mat over the lower leaf surface outside the spots, producing basidia. Inoculations with basidiospores, sclerotia, and mycelium were all successful, but only very young leaves became infected by the first-named. The incubation period was ± 14 days. Infections by mycelium on full-grown leaves were successful only when introduced into fresh cuts. Bordeaux mixture and sanitary measures are recommended for control.

**Ovulinia, a new generic segregate from Sclerotinia,** F. Weiss. (U. S. D. A.). (*Phytopathology, 30 (1940), No. 3, pp. 236–244, figs. 3*).—Following a preliminary report previously noted (E. S. R., 81, p. 232), the author here describes and illustrates *O. azaleae* n. gen. and sp. as the cause of a destructive disease affecting the flowers of cultivated azaleas in the southeastern and southern United States. The life history of the pathogen is outlined, and technical descriptions of the new genus and species are presented.

**Flower blight of Camellias,** H. N. Hansen and H. Earl Thomas. (Univ. Calif.). (*Phytopathology, 30 (1940), No. 2, pp. 166–170, figs. 2*).—A new disease affecting the flowers of *Camellia japonica*, shown to be due to *Sclerotinia camelliae* n. sp., is described. Early sumptoms on the petals appear soon after late-winter and spring rains as small brown specks which soon enlarge and coalesce, causing the whole flower to turn brown and fall. Sclerotia, formed within the flower, rest on or in the ground for 1 yr. or more before producing apothecia. The ascospores are wind-borne but no viable conidia were found.

For control, destruction of all fallen flowers for several consecutive seasons is suggested.

**Rose diseases,** E. W. Lyle (*Texas Sta. Cir. 87 (1940), pp. 16, figs. 7*).—In this informational circular data are presented on six leaf, two stem, and three root diseases and their control. Most of them are also illustrated.

**Forest pathology in North America,** T. R. Peace (*Forestry, 13 (1939), No. 1, pp. 36–45*).—This paper is based on a 4 months' tour (1938) in the course of which the author visited 36 States of the United States and 3 Canadian provinces. There are 41 literature references.

**Observations on two ambrosia beetles and their associated fungi,** J. G. Leach, A. C. Hodson, St. J. P. Chilton, and C. M. Christensen. (Minn. Expt. Sta.). (*Phytopathology, 30 (1940), No. 3, pp. 227–236, figs. 4*).—*Trypodendron retusum* and *T. betulae*, affecting aspen and paper birch, respectively, and their associated ambrosia fungi, were studied and are described. The two fungi, grown in pure culture, are considered very closely related strains of a single species. It is probably not identical with any previously named fungus, but, because of the lack of any extensive study of the ambrosia fungi associated with other ambrosia beetles, it is not here designated as a new species. Pending further studies, the isolates may be considered strains of *Monilia candida*.

**Susceptibility of species of Cupressaceae to crown gall as determined by artificial inoculation,** C. O. Smith. (Calif. Citrus Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *59 (1939), No. 12, pp. 919–925, figs. 4*).—Wound inoculations with *Bacterium* (=*Phytomonas*) *tumefaciens* on the following species of *Cupressus*—*arizonica, bakeri, benthami, duttoni, forbesii, glabra, guadalupensis, goveniana, lusitanica, knightiana, macrocarpa, montana, macnabiana, nevadensis, pygmaea, sargentii, sempervirens, thurifera,* and *torulosa*—induced typical galls on all except *C. guadalupensis, C. montana,* and *C. glabra* (*C. arizonica bonita*), knoblike projections only developing on the last two. Typical galls developed on *Juniperus virginiana, J. procera,* and *J. phoenicea,* and knoblike projections on *J. ashei, J. cedrus,* and *J. hibernica. Libocedrus decurrens, Thuja plicata, T. occidentalis, T. orientalis,* and *Thujopsis dolabrata* were especially susceptible to crown gall when inoculated. *Chamaecyparis lawsoniana* was apparently resistant.

**Attempts to isolate Ceratostomella ulmi from stored elm wood,** R. P. True and S. S. Slowata. (U. S. D. A.). (*Phytopathology, 30 (1940), No. 3, pp. 272–274*).—Using infected pieces of elm wood stored under three different field conditions (on the ground in deep forest shade, on the grass and unshaded except for weeds, and on a rack 18 in. above the ground and in direct sunshine most of the day), the authors found that with the passage of time *C. ulmi* was recovered from fewer sticks. After 4 mo. only a part of the sticks stored under each condition yielded the fungus, while after 20 mo. it was recovered from only a small percentage of all sticks, except those stored in the woods and with the most severely infected portion oriented downward. Peeled sticks yielded *C. ulmi* in consistently lower percentages than nonpeeled sticks after 4 mo. under all conditions of storage, but after 20 mo. the differences were slight or negligible except for those stored in the woods with the worst infected side downward. The effects of place of storage and orientation of the most severely infected side were exhibited with less consistency and were, in many cases, small or negligible.

**Lightning injury of black locust seedlings,** L. W. R. Jackson. (U. S. D. A. et al.). (*Phytopathology, 30 (1940), No. 2, pp. 183, 184, fig. 1*).—Lightning is reported to have killed or injured emerging black locust seedlings over an

area of 50 by 100 ft. in a forest tree nursery near New Brunswick, N. J., the deeper roots being killed but the shoots failing to show external signs of injury.

**Chemical and mechanical methods of Ribes eradication in the white pine areas of the Western States,** H. R. Offord, G. R. Van Atta, and H. E. Swanson (*U. S. Dept. Agr., Tech. Bul. 692 (1940), pp. 50, pls. 11, figs. 2*).—Toward controlling *Cronartium ribicola* in the Western States, chemical and mechanical methods have been developed for eradicating troublesome species of *Ribes* not effectively removable by pulling and digging. Sodium chlorate mixed with calcium chloride (Atlacide) was used at the rate of 960 lb. per acre to kill *R. petiolare*. For safe handling under forest conditions, sodium chlorate should be combined with $CaCl_2$, $NaHCO_3$, or borax. Both small- and large-scale field tests showed the importance of dosage in relation to the practical use of herbicides for *Ribes* eradication. Initial treatment should be made with the practical lethal dosage (killing 99 percent or more of the plants) for a susceptible species such as *R. petiolare*, and with the dosage of maximum efficiency (killing ± 81 percent of the plants) for a resistant one such as *R. inerme*. Large or troublesome individual plants are killed by cutting off their tops and applying Diesel oil, saturated ammonium thiocyanate solution, dry sodium thiocyanate, or a mixture of dry sodium chlorate and borax (1:5) to the exposed root crown. Tests with a specially devised bulldozer indicated it to be cheaper and more effective than hand slashing or chemicals for permanently suppressing *R. inerme* associated with dense brush. Brief notes are given on the scope and limitations of special *Ribes* eradication methods, such as plowing, blasting, burning, and flooding. Knapsack spray tanks, a portable power sprayer, and a special canteen and syringe have been devised to facilitate handling and application of chemicals under forest conditions.

**The relation of plant pathological technique to seed laboratory practice,** R. H. Porter. (Iowa State Col.). (*Chron. Bot., 5 (1939), No. 4–6, pp. 442–444*).—Technics are described for detection and identification of organisms and other disease entities on or in seeds and vegetative reproductive organs, determination of the effect of certain organisms on seed germination, laboratory study of the effect of seed disinfectants on seed germination and disease control, correlation of field and laboratory response of both treated and untreated seeds, and determination of relative resistance of improved varieties of crop plants to specific organisms.

**A monograph of the nematodes of the superfamily Dorylaimoidea,** G. Thorne (In *Capita Zoologica. 's Gravenhage (The Hague): Martinus Nijhoff, 1939, vol. 8, pt. 5, pp. 261, pls. 32, figs. 240*).—This monograph presents studies of a group constituting the most numerous of free-living nematodes found in the soil and an important portion of those inhabiting fresh water. In general, they are said to make up 20–50 percent of the free-living nematodes present, and those which inhabit cultivated fields are of special interest because of their relationships to the crops grown thereon. Preceding the main body of the work, which takes up the specific genera and species (with keys), the author discusses the history and present status of the superfamily, the morphology of the group, and the procedure followed in nemic descriptions, and gives a brief outline of the systematic section. An index and 163 bibliographic references are provided.

## ECONOMIC ZOOLOGY—ENTOMOLOGY

**[Work in game management by the Wisconsin Station]** (*Wisconsin Sta. Bul. 446 (1939), pp. 21–23, fig. 1*).—Studies briefly reported (E. S. R., 81, p. 67) relate to the spread of the Hungarian partridge, by A. S. Leopold; tree buds as a winter food for prairie chickens, by F. Hamerstrom, Jr., and F. Hopkins; the

yield of weed crops and waste grain as food for pheasants, quail, rabbits, and song birds, by Leopold and L. Sowls; and the range of the cottontail rabbit within a year.

**Fifty years of entomological progress, I–V** (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 8–65*).—This discussion appears in five parts and covers as many decades, commencing with 1889, in which year at a meeting held near Toronto, Canada, on August 30 the American Association of Economic Entomology was organized. The years 1889–99 are reviewed by C. L. Marlatt (pp. 8–15); 1899–1909, by L. Caesar (pp. 15–21); 1909–19, by C. L. Metcalf (pp. 21–30) (Univ. Ill.); 1919–29, by E. O. Essig (pp. 30–58) (Univ. Calif.); and 1929–39, by S. A. Rohwer (pp. 58–65) (U. S. D. A.).

**[Notes on economic insects and their control]** (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 113, 114, 199–204*).—The contributions presented (E. S. R., 82, p. 645) are: A Note on the Frequency Distribution of Black Scale Insects, by W. M. Upholt and R. Craig (pp. 113, 114) (Univ. Calif.); Mounding Peach Trees Following Applications of Ethylene Dichloride Emulsion and of Paradichlorobenzene Crystals (p. 199) and Control of Black Peach Aphis (p. 204), both by S. C. Chandler; A New Pest of Hollyhock, *Anthomyza angelicae* Frost, by R. Hansberry (p. 199) (Cornell Univ.); Some Newly Discovered Habits of the Codling Moth, by G. E. Marshall (p. 200) (Ind. Expt. Sta.); Some South Sea Island Aphids, by E. O. Essig (pp. 200, 201), and Male Scale Injurious to Olives, by E. L. Wampler (p. 203) (both Univ. Calif.); A Brazilian Parasite [*Aenasius paulistus* Comp.] of *Pseudococcus maritimus* (Ehrh.) (p. 201) and A Coccinellid [*Scymnus flavifrons* Blackb.] Introduced Into California (pp. 202, 203), both by S. E. Flanders (both Calif. Citrus Sta.); Epidemics of Fungus Disease Control Insect Pests in Puerto Rico, by G. N. Wolcott and L. F. Martorell (pp. 201, 202), and A Tachinid Parasite [*Euphasiopteryx australis* Towns.] of the Puerto Rican Changa, by G. N. Wolcott (p. 202) (both Puerto Rico Col. Sta.); Activities of the Adult White-Fringed Beetle [*Pantomorus leucoloma* (Boh.)] in New Orleans and Vicinity From September 1938 to May 1939, by E. M. Livingstone and G. R. Swank (pp. 203, 204) (U. S. D. A.); and The European Earwig in Utah, by G. F. Knowlton (p. 204) (Utah Sta.).

**[Contributions on entomological technic]** (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1939, ET–152, pp. 4, pl. 1; 1940, ET–153, pp. 3, pls. 3; ET–154, pp. 2, pls. 2; ET–155, pp. 2, pl. 1; ET–156, pp. 2, pls. 2; ET–157, p. 1, pl. 1*).—Further contributions (E. S. R., 82, p. 70) are A Method for Testing the Value of Chemical Mixtures as Repellents of the Gulf Coast Tick, by A. L. Brody (ET–152); A Portable Wind-Direction Recorder, by R. A. Fulton (ET–153) (noted on page 18); A Low-Cost Water Seal Fumigator, by A. C. Johnson (ET–154); A Laboratory Method for the Study of Insects in Their Cocoons, by L. C. Fife (ET–155); A Methyl Bromide Dispenser for Use in the Fumigation of Quarantined Products, by C. A. Cain (ET–156); and Modified Berlese Funnel for Collecting Thrips, by F. F. Bondy (ET–157).

**Report of the Chief of the Bureau of Entomology and Plant Quarantine, 1939**, L. A. Strong (*U. S. Dept. Agr., Bur. Ent. and Plant Quar. Rpt., 1939, pp. 117*).—The work of the year (E. S. R., 80, p. 794) with fruit and nut insects included codling moth control by the use of insecticides, baits, and mechanical and biological methods; apple maggot, red spider on apple, pear thrips on prunes, peach borer, plum curculio, grape berry moth, grape leafhopper, hickory shuckworm on pecan, pecan nut casebearer, and citrus red mite control by insecticides; oriental fruit moth control by parasites; fumigation treatment and use of shade cloth for protection of dried peaches on the ranch; California red scale control by fumigation and insecticides; control of citrus thrips on lemons by sulfur

dusting; insecticide tests with the purple scale and the Florida red scale; Japanese beetle control by insecticides, fumigation, and parasites; and Mexican fruitfly control by the vapor-heat method of sterilization.

Insects affecting forest and shade trees referred to include the western pine beetle, mountain pine beetle, Black Hills beetle, hemlock borer, European spruce sawfly, insect vectors of the Dutch elm disease, and the gypsy and the browntail moth.

Cereal and forage insect investigations dealt with include the white-fringed beetle *Pantomorus leucoloma* (Boh.); grasshoppers (E. S. R., 82, p. 73); the Mormon cricket; European corn borer; corn earworm; an insect pest of the sweetclovers and possibly of alfalfa, *Hypera brunneipennis* Boh., new to the United States; the vetch bruchid; hessian fly; sugarcane borer; and fumigation for stored grain insects (E. S. R., 80, p. 370).

Insects affecting truck and garden crops, berries, tobacco, bulbs, and ornamentals reported upon include the tomato fruitworm, tomato pinworm, hornworms (tomato worm and tobacco worm) on tomatoes and tobacco, pea weevil, gladiolus thrips, celery leaf tier, imported cabbageworm, southern armyworm, corn root webworm, tobacco flea beetle, strawberry weevil, beet armyworm, Mexican bean beetle, corn earworm on lima beans, cabbage looper, diamondback moth, pea aphid, turnip aphid, raspberry fruitworm, common red spider, onion thrips, greenhouse thrips, *Taeniothrips xanthii* Williams, zebra caterpillar, mole crickets (*Scapteriscus* spp.), sweetpotato weevil, cutworms, leafhoppers, Colorado potato beetle, mealybugs, sugar-beet wireworm, Pacific coast wireworm, raspberry root borer, and slugs and snails.

Cotton insects dealt with are the bollweevil, cotton flea hopper, certain hemipterous insects, bollworm, pink bollworm, root aphid *Trifidaphis phaseoli* (Pass.), cotton leaf worm, and the thurberia weevil.

Data on bees related to resistance to foulbrood, lethal effects of insecticides, breeding, nutrition, pollination, and honey plants.

Work with insects affecting man and animals considered included screwworms and the fleece worm *Phormia regina* (Meig.); horn flies; cattle grubs; external parasites of sheep, goats, and cattle; fly sprays; mosquitoes; American dog tick; and household and stored-product insects.

Insecticides and related studies under way include testing of insecticides; fumigation investigations; physiology of insects; and chemical investigations on (1) insecticidal plants (tobacco, derris, pyrethrum, etc.) and their constituents, (2) the development of synthetic organic insecticides, (3) spray residues and their removal, (4) the development of inorganic insecticides, (5) fumigants for control of insect pests, (6) accessory materials for use with insecticides, and (7) the determination of the toxicity of new insecticidal compounds to goldfish.

Plant disease work of the Bureau is noted on page 67.

**[Work in economic zoology and entomology by the Arkansas Station]** (*Arkansas Sta. Bul. 386 (1940), pp. 63–68*).—The work of the year reported upon (E. S. R., 80, p. 793) relates to the sugarcane beetle and the bobwhite quail (*Colinus virginianus*), both by W. J. Baerg; the end of the hatching period of the codling moth and the important period of bollworm injury, both by D. Isely; biology of Thibault's mosquito *Aedes thibaulti* D. & K., by W. R. Horsfall; and grasshopper investigations and an annual white grub, *Cyclocephala immaculata* Oliv., both by M. W. Sanderson.

**Some entomological observations in California, A. E. Michelbacher.** (Univ. Calif.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 141–143*).—This contribution relates particularly to the western spotted cucumber beetle, which

has seriously damaged the pole bean crop near San Jose, Calif., during the past few years, the corn earworm, and hornworms.

**[Work in entomology by the Delaware Station]** (*Delaware Sta. Bul. 220 (1939), pp. 22–28, 37–39*).—The work of the year (E. S. R., 81, p. 238) briefly reported relates to the occurrence of the European corn borer, corn earworm, sawflies, Japanese beetle, and other important insects, by L. A. Stearns; bionomics and control of the codling moth, by Stearns, R. L. Pierpont, D. MacCreary, and W. W. Fassig, and of the oriental fruit moth, by J. M. Amos and Stearns; mosquito investigations, by Stearns, MacCreary, and F. C. Daigh; control of the strawberry weevil, by Amos; distribution and host relationships of the American dog tick in Delaware, by MacCreary; and a study of the factors and chemistry involved in the production of injury to apples and peaches from the use of standard spray schedules, by K. J. Kadow, M. W. Goodwin, and S. L. Hopperstead.

**[Work in economic entomology by the Iowa Station]** (*Iowa Sta. Rpt. 1939, pt. 2, pp. 62, 63*).—The work of the year briefly reported upon (E. S. R., 81, p. 65) includes white grub investigations, by C. J. Drake and E. V. Collins; ecology and control of sod webworms in permanent pasture and cultivated fields, by G. C. Decker; and bionomics and control of the chinch bug, by Drake, C. H. Richardson, and Decker.

**[Work in entomology by the New Mexico Station]** (*New Mexico Sta. Rpt. 1939, pp. 42–44*).—The activities of the year briefly reported upon (E. S. R., 81, p. 808) deal with codling moth baits and insecticides and hemipterous insects affecting cotton.

**Undesirable insect aliens**, E. R. Sasscer. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 1–8*).—The presidential address delivered at the fifty-second annual meeting of the American Association of Economic Entomologists.

**Small plots in field experiments on hop pests**, H. E. Morrison. (Oreg. Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 112, 113*).—The data obtained in small plat work with the common red spider in hop fields of Oregon, in which it was necessary to develop a suitable experimental method, indicate that seven replications of treatment are necessary with this pest in hop fields. Eight treatments were made possible by the employment of the small plat system of experimentation.

**Seasonal history of hop pests on Oregon hops during 1938**, H. E. Morrison. (Oreg. Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 70, 71, figs. 3*).—These seasonal history notes relate to the common red spider; the hop aphid; three species of thrips, namely, *Aeolothrips melaleucus* Haliday, *Frankliniella moultoni* Hood, and the onion thrips; the omnivorous leaf tier *Cnephasia longana* Haw.; and the mourning-cloak butterfly *Nymphalis antiopa* L. as observed at the experimental hopyard at Corvallis, Oreg.

**Flight habits and seasonal abundance of dried-fruit insects**, D. F. Barnes and G. H. Kaloostian. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 115–119, fig. 1*).—Report is made of the results of a study of the flight habits and seasonal abundance of insects which infest stored raisins, conducted during the summer of 1938 in a raisin storage yard at Fresno, Calif. Use was made of a motor-driven rotary net developed by J. C. Chamberlin and F. R. Lawson and employed by them in investigations of sugar beet insects. Details of the findings are given in table and graph form.

The operation of the net from April 14 to October 31, 1938, gave data on the comparative abundance from day to day of 16 species or groups of insects. "The raisin moth and the Indian-meal moth made up 94 percent of the moths recorded. Among the beetles the nitidulids and the dermestids were the most

plentiful in the air. The most abundant insect in stored raisins, the saw-toothed grain beetle, was taken from the air in very small numbers. The flight habits of 12 species or groups were studied in detail by means of collections made at intervals of 15 min. on 10 days. The dried fruit beetle and the dermestids were shown to be insects which fly during daylight hours; the other beetles recorded were predominantly crepuscular in their flight habits. All the species of storage moths captured flew during the night, flight usually beginning about sunset. On warm nights the raisin moth and *Ephestiodes nigrella* were on the wing until sunrise."

**Factors concerned in the deposit of sprays.—VII, Design and use of a photographic apparatus for studying the impact and movement of individual drops upon a surface,** W. M. Upholt and W. M. Hoskins. (Univ. Calif.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 102–107, figs. 5*).—In this further contribution (E. S. R., 81, p. 242), an apparatus designed for taking pictures with very short exposure, of drops of a liquid at any desired time before, during, or after contact with a solid surface is described and figured. From the photographs, accurate measurements can be made of the advancing and receding angles. "The effects of continued spraying may be studied by allowing any desired number of drops to strike and move down the surface. Since the method is relatively cheap, it enables many tests to be made so that small differences in behavior may be evaluated with precision."

**Presentation of time-dosage-mortality data by three-dimensional graphs,** R. Hansberry and S. F. Chiu. (Cornell Univ.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 139–141, figs. 3*).

**Determination of mineral oil deposits on plant surfaces in field and laboratory,** G. S. Hensill (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 155–159*).—A report is made of a new method for determining the deposit of mineral oil on foliage at the time of application, which has been developed and used extensively. The results are not affected by penetration of oil and other factors. The method has given concordant results in duplicate tests not only on citrus leaves in both the field and the laboratory but also on the twigs (bark surface) of deciduous trees in field and laboratory.

**Particle size of commercial lead arsenate by sedimentation analysis,** L. D. Goodhue. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 170–172*).—Report is made on the continuation of studies of commercial insecticides (E. S. R., 77, p. 509; 78, p. 661; 79, p. 654; 81, p. 542), in which the particle-size distribution of nine brands of lead arsenate has been determined. The details are given in table form.

**Preparation of commercial calcium arsenate for use as an orchard insecticide,** G. W. Pearce and A. W. Avens. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 159–162*).

**Chloropicrin as a prewarning gas in ship fumigation,** G. C. Sherrard (*Pub. Health Rpts. [U. S.], 54 (1939), No. 52, pp. 2297–2302, pls. 2*).

**Toxicity of phosphorus to cockroaches,** T. H. Cheng and F. L. Campbell. (Ohio State Univ.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 193–199, figs. 2*).

**The distribution of injurious thrips in the United States,** S. F. Bailey. (Univ. Calif.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 133–136, fig. 1*).—A study of the distribution of 32 species or generic groups of thrips in the United States, the details being given in table and map form.

**A new species of thrips from the Mojave Desert,** S. F. Bailey. (Univ. Calif.). (*Pan-Pacific Ent., 15 (1939), No. 4, pp. 168–172, figs. 2*).—A thrips taken from *Oenothera dentata parishii*, particularly at Hinkley in San Bernardino County, Calif., is described as new under the name *Dactuliothrips diversus*.

**Control of the chinch bug in Nebraska,** M. H. Swenk and H. D. Tate (*Nebraska Sta. Cir. 61 (1940), pp. 19, figs. 7*).—A practical account of this pest, particular attention being given to means of control.

**A new machine for turf dusting and hairy chinch bug control,** L. Pyenson (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 153–155, fig. 1*).—A description is given of a machine which uses new principles in the application of dusts to turfs. "This machine drives dusts evenly into the turf and draws back into the air stream by means of a vacuum return some of the waste dust. By using these new principles of application, economic control of hairy chinch bugs may be obtained with one-third the amount of 1 percent rotenone dust formerly recommended. Light even applications of lead arsenate dust to turf for white grub and sod webworm control are also made practical through the use of this newly designed machine."

**Whitewash to control potato leafhopper on citrus,** R. S. Woglum and H. C. Lewis (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 83–85*).—The authors have found that overwintering adult potato leafhoppers cause fruit spotting on mature oranges in the central California citrus areas. As a repellent whitewash has given quite satisfactory results. The entire trees are given an outside coating of a spray containing "100 lb. of hydrated lime, 25 lb. of zinc sulfate, and 12 oz. of blood albumin spreader in 300 gal. of water. The cost of this treatment is about $8 per acre. The inclusion of zinc is of additional benefit in mottle-leaf control and tree growth stimulation."

***Injury to pea vines caused by the feeding of the pea aphid,*** C. E. Dieter and H. F. Wilson. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 11, pp. 805–814, figs. 5*).—This contribution reports upon a detailed study of the effect of aphid attack made with a view to furnishing information concerning the relationships between the growth of the plant, the development of aphid populations, and the extent of injury caused by aphids feeding upon the pea vine. It is shown that when a single agamic female and her progeny are allowed to remain on a plant of any age for 10 days, there is a definite injury to the plant, and that when not removed as soon as the plant begins to wilt, it is soon destroyed. As a result of aphid feeding, the stipules and leaves are reduced in size or destroyed and the internodes are shortened in the area occupied by a limited infestation of aphids. The extent of the injury to pea plants was found to be directly proportional to the number of aphids present. With comparable infestations the injury was more pronounced on younger than on older plants and on less vigorous than on strongly growing plants. Aphid infestations on older plants caused a delay in the blossoming period of as much as 2 weeks. Under the controlled conditions of temperature and moisture maintained in these experiments it was found that if a single agamic female was placed on a plant at blossom time and before the pods were set, she and her progeny could cause complete destruction of the blossoms and prevent the development of the pods.

**The pea aphid on canning peas in eastern Washington as influenced by alfalfa plantings,** R. D. Eichmann. (Wash. Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 137–139, figs. 5*).—The author has found that hay meadow alfalfa is the chief factor in maintaining an aphid population in the canning pea district of southeastern Washington. "Alfalfa grown for this purpose serves as the principal overwintering host, allows heavy populations to build up early in spring previous to migration to other hosts, and carries the late summer population. Erosion control alfalfa, especially at high elevations, does not serve as an aphid host in any of these categories. It does, however, afford succulent host plants scattered throughout the area at the time aphids are

migrating from hay meadow alfalfa. More important as host plants at this time are the large fields of early peas which are usually grown adjacent to hay meadows at lower elevations. Both early peas and erosion control alfalfa support populations of aphids which later move to the main crop of peas. On this account erosion control alfalfa is not essential to the migration cycle, and apparently it has not aggravated the pea aphid problem."

**Pea aphid control experiments in Oregon,** K. W. Gray and J. Schuh. (Oreg. Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 72–77, fig. 1*).—The results of control experiments with the pea aphid, principally during the 1938 season where only dusts were used, are reported, details being given in tables. The applications were made by means of hand dusters on trellis peas in the coastal area of Oregon. "The plat arrangement was a modified Latin square in replica of four. Each replica consisted of three rows 15.5 ft. long with the rows 5.5 ft. apart. Populations were measured by counts of aphids on plant tips and reduced to mean number of aphids per tip for comparison. Five counts were made on each plat during the season. Insecticides used included rotenone, nicotine, pyrethrum, and Loro. Talc was used as the carrier for all the insecticides except nicotine where hydrated lime was used. A rotenone dust containing 4 percent of a vegetable or animal oil appears to have possibilities of producing a more effective kill at less cost than other dust combinations tested. Rotenone dust with a wetting agent did not give as good control as did rotenone and oil. Nicotine and pyrethrum dusts were inferior to the rotenone-oil dusts. Loro-rotenone dusts gave good kills but produced a slight burn on the tender plant tips. Spray tests conducted prior to 1938 indicate that a satisfactory control may be obtained on peas grown on trellises by the use of a spray containing rotenone, 1 part in 10,000, wetting agent (Aresket 240) 1 part in 660, and fish oil soap 1 part in 440 applied at about 300 gal. per acre."

**A contribution to the knowledge of the Aphididae of Nevada,** E. A. Drews. (Univ. Calif.). (*Pan-Pacific Ent., 15 (1939), No. 4, pp. 175–178*).—An annotated list is given of 32 aphids that occur in Nevada.

**Toxicants and solids added to spray oil in control of California red scale,** W. Ebeling. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 92–102, figs. 10*).—Increasing the effectiveness of oil sprays against the California red scale by the addition of derris resins containing 25 percent rotenone in suitable mutual solvents has shown sufficient promise to warrant further investigation. In the course of orchard experiments counts were made of the natural mortality prior to treatment, and the percentage of survival of adult female scales was recorded after treatment. "Counts were made of dead and live scales on 20 fruits and 20 units of branches on each of 10 lemon trees in each plat. A branch unit consisted of 2 in. of an infested branch as seen from one aspect. Only adult female scales were examined. The effectiveness of oil spray decreases as the population density increases; therefore, 'survival curves' were prepared to show the relation of percentage of survival to population density. A comparison of the survival curves shows the relative effectiveness of the treatments.

"In order to correlate the deposit of oil with the effectiveness of the various sprays, a method was developed by which the upper surfaces of each of 50 leaves were sprayed. After the water had evaporated from the leaves, the oil was washed off with petroleum ether. The oil and solvent were then filtered, the ether was evaporated by heat, and the oil was weighed in 50-cc. beakers. The oil-toxicant sprays, in which 10 percent derris resins in dibutyl phthalate were added to oil in the proportion of 1 part of toxic solution to 15 parts of oil, deposited much less oil than the sprays containing the same amount of oil but

no toxic solution. However, despite the lower oil deposit, the oil-toxicant sprays resulted in a greater mortality of red scale. The addition of walnut-shell flour to emulsive oil resulted in an increase in the effectiveness of the oil against the red scales without increasing oil deposit. When the walnut-shell flour was added to the oil-toxicant solutions, their effectiveness was also increased. Thus the addition of 1 part of a 5-percent solution of derris resins in dibutyl phthalate to 7 parts of medium oil at 2-percent concentration resulted in a survival of 3.9 percent of adult female insects on the branches of lemon trees, as compared to a survival of 21.2 percent when the oil was used alone at 2-percent concentration. When 3 lb. of walnut-shell flour were added to 2 gal. of the oil-toxicant, however, only 0.98 percent of the insects survived the treatment. Similar increases in the effectiveness of the oil by the addition of toxicant and walnut-shell flour were shown by counts made on the fruits."

A list is given of 15 references to the literature.

**Toxicity of hydrocyanic acid to eggs of black scale (Saissetia oleae Bern.)**, A. F. Swain and R. P. Buckner (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 107–111, fig. 1*).—Experiments in which hydrocyanic acid was used as a fumigant for the black scale have shown the vapor to be highly toxic to the eggs at short exposures and in concentrations suitable for fumigation of citrus trees. "The winter eggs are less susceptible than the summer eggs, but fortunately much higher concentrations of HCN can be used in winter fumigation than in summer. The minimum normal dosage for winter fumigation is 20 cc. per unit, which is equivalent to the maximum concentration used in these experiments. The normal summer dosages are 16 cc. and 18 cc. per unit, which are equivalent to the 0.080 and 0.090 percent HCN concentrations used. At these concentrations no egges hatched in any of the experiments after June 4, which was 6 or 7 weeks earlier than commercial fumigation started in any of the localities from which eggs for these experiments were obtained. The fact that the difference in susceptibility to HCN of black scale from different localities is not carried over into the eggs, and the further evidence of the high toxicity to the eggs of HCN at concentrations usable in field fumigation, indicate that satisfactory control of 'resistant' black scale might be secured by earlier season fumigation."

***Rating thoroughness of application in spraying citrus trees***, R. H. Smith. (Univ. Calif.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 85–91*).—In experiments with various oil sprays in the control of black scale the range in degree of thoroughness of spray application was found to be as great as the range in killing values among the spray compositions tested. "Three methods were employed in evaluating thoroughness of application. The first involved the examination of clusters of leaves, fruits, and twigs immediately after spraying to determine whether or not uncovered parts were present; the second, the examination of leaves 3 or 4 weeks after spraying to determine the number and distribution of insects that survived the spray treatment; [and] the third involved the making of unit counts in June following the spraying in August of the preceding year to determine the number of insects present in rows of trees treated by different spraymen. Ratings on the work of 44 spraymen are given in detail in five tables. Marked differences in proficiency of spray application are shown by the tabulated counts."

**Methyl bromide fumigation for destruction of pod borer larvae**, R. Latta. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 176–179*).—Experimental studies conducted at New York City and San Juan, P. R., from November 1938 to April 1939 showed that the larvae of the bean pod borer *Maruca testulalis* Geyer can be killed by fumigation with methyl bromide. "Fumigation at dosages as

low as 0.5 lb. per 1,000 cu. ft. caused complete mortality at normal temperatures (above 70° F.) either in a 15-in. vacuum for 90 min. or under atmospheric pressure for 2 hr. At low temperatures high dosages of the fumigant were required. Green lima beans, pigeonpeas, and string beans were uninjured at dosages considerably above those needed to kill the larvae. The first two products were also tested under commercial conditions. For fumigation of commercial shipments 1.5 lb. of methyl bromide per 1,000 cu. ft. should be used at temperatures above 70°, either in a 15-in. vaccum for 90 min. or at atmospheric pressure for 2 hr., and 3 lb. per 1,000 cu. ft. for 90 min. in a 15-in. vacuum for temperatures below 70°."

**The activity of adult codling moths as indicated by captures of marked moths,** E. R. Van Leeuwen. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 162–166*).—A number of experiments which included the release and recovery of marked moths, conducted at Yakima, Wash., during the course of studies of the use of baits in codling moth control, are reported upon. "In addition to records on the proportion of the marked moths recovered, much information was obtained on their flight habits. The percentage of recovery of marked moths ranged from 6 percent to 96 percent. The highest recoveries were made with baits composed of fermenting molasses with pine tar oil in an isolated orchard in which nearly every tree was baited. Most of the moths recovered in an 8-acre baited area of an apple orchard were taken within 150 ft. of the point of release. The average distance traveled was 143 ft. About three-fourths of the moths recovered were taken within 6 days. The spread of moths from the point of liberation appears to have been greatest in a northerly direction, or against the prevailing winds. Of the moths liberated at various distances outside the baited areas very few were recovered, an indication that the bait used did not attract many of the moths long distances."

**Experiments with pyrethrum for the control of codling moth Carpocapsa pomonella L.),** C. B. Gnadinger, J. B. Moore, and R. W. Coulter (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 143–153, figs. 7*).—These experiments included the use of pyrethrin-oil spray for the pupae and overwintering larvae and pyrethrum dust, in conjunction with oil sprays, for the control of adult moths, eggs, newly hatched larvae, and mature larvae.

**General information concerning the oriental fruit moth in Japan and Chosen,** G. J. Haeussler. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 189–193, fig. 1*).—The results of observations of the oriental fruit moth conducted during 1932 and 1933 in Japan and Chosen (Korea) are reported upon under the headings of distribution, host plants and injury, life history and habits, and control measures.

**Life history of the western strawberry leaf roller with notes on its control,** G. R. Ferguson. (Oreg. Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 121–123*).—The results of observations of the life history and the effect of certain cultural practices on the populations of the western strawberry leaf roller *Anacampsis fragariella* Busck during the seasons of 1937 and 1938 are reported. It was apparent that topping and covering strawberry plants after harvest may give a high degree of protection against oviposition by the moths.

**The spring cankerworm and its control,** L. Haseman (*Missouri Sta. Cir. 205 (1940), pp. 4, figs. 2*).—A practical account.

**Tests with methyl bromide as a fumigant for larvae of the artichoke plume moth,** W. H. Lange, Jr. (Calif. Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 66–69, figs. 4*).—Report is made of control work with the artichoke plume moth, which is spread primarily as larvae in artichoke planting stock where they are, for the most part, internal borers in the leaf petioles.

The results of toxicity tests of methyl bromide ($CH_3Br$) as a fumigant for the larvae 48 hr. after treatment and to artichoke plants set out in the ground 10 hr. following their exposure, are reported in detail in table form. It was found to give practically a perfect kill of the larvae within the plants at standard dosages. "No immediate injury to the plants after treatment was found, but in from 10 to 20 days a noticeable retardation of growth was recorded with death often following. The injury to the plants was not regarded as being of a mechanical nature, but rather chemical or physiological. A delayed kill of the larvae was found in certain cases, with death taking place in from 2 to 14 days. The most satisfactory treatment giving a high kill of larvae with minimum injury to the plants was found in the vacuum fumigation treatment using a reduced dosage of 1 lb. per 1,000 cu. ft., exposure of 2 to 2.5 hr., and a temperature of from 72° to 76° F. Atmospheric exposures could not be recommended because of the increased injury to the plants."

**A new Angitia, parasitic on the artichoke plume-moth (Hymenoptera, Ichneumonidae)**, R. A. Cushman. (U. S. D. A.). (*Pan-Pacific Ent., 15 (1939), No. 4, pp. 183–185*).—*A. platyptiliae*, distinguished from another western species parasitic on pterophorid larvae (*A. pterophori* (Ashm.)), is described as new. It was reared from the artichoke plume moth at Half Moon Bay, Calif.

**Control experiments on the tomato fruitworm in southern California during 1937**, J. Wilcox and M. W. Stone. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 129–133*).—In a study conducted at several points in southern California, in the course of which 523 field plats of tomatoes were treated to control the tomato fruitworm *Heliothis obsoleta* (F.), 50 percent cryolite dust with talc as the diluent and a bait made of corn meal 25 lb. and cryolite 1 lb. were found to be the most promising materials. "Usually three applications of each material were made, the first being applied when plants had a spread of about 1 ft., the other applications following at 2-week intervals. The dust was applied with rotary hand dusters, and the bait was scattered by hand over the leaves of the plants. Sprays were also tried in several fields, and the most promising was phenothiazine, 3 lb. to 100 gal. of water."

**Effect of temperature and moisture on overwintering pupae of the corn earworm in the Northeastern States**, G. W. Barber and F. F. Dicke. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 10, pp. 711–723, figs. 2*).—Report is made of work at New Haven, Conn., and Arlington, Va., from 1936 to 1938 with a view to determining the primary environmental factors responsible for the high mortality among the pupae of the corn earworm during hibernation. In the Northeastern States this pest hibernates as a pupa from September to June, or at least 9 mo., at the bottom of a tunnel usually from 2 to 4 in. below the surface of the soil, the wall of which is firmly packed and lined with silk to hold it intact. The heaving of the moist soil by alternate freezing and thawing and invasion by roots and earthworms are important agencies that disrupt the tunnels, causing the pupae to become embedded in the soil and die. Well-drained, particularly sandy, soils provide conditions favorable for survival.

Pupae exposed in the atmosphere of a heated room lost 10 percent of their weight in 1 mo. as compared to 1.7 percent when placed between moist paper towels in a cool room. Submerged pupae gained slightly in weight. Pupae were observed to float in flooded tunnels. At 75° F. 20 percent survived submergence for 10 days whereas 84 percent survived the same exposure at 40°. In the atmosphere of sealed tubes ranging from 1.5 to 12.5 in. in length, exposed to 40° for 208 days, pupae survived in all but the shortest tubes. At Arlington during the winter of 1936–37, 27.4 percent of the hibernating pupae

survived exposure to outdoor temperatures on dry soil in salve boxes, whereas there was no survival on moist soil. In the winter of 1937–38 under similar conditions, 52 percent survived on dry sand and 1.3 percent on moist sand. The minimum temperature for the winter of 1936–37 was 15° and that for 1937–38 was 14°. The higher rate of mortality of pupae in the moist environment is attributed to the higher thermal conductivity of moist soil, more body moisture, and a moist exoskeleton, which practically becomes fused to the soil when it freezes, allowing the body heat to be given up readily.

**Rearing of mosquito larvae and effect of diet on their resistance to rotenone and nicotine,** A. M. PHILLIPS and M. C. SWINGLE. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 172–176*).—A description is given of a convenient and economical method of rearing and testing mosquito larvae. "A brief study was made of the relative resistance of larvae reared on a number of different diets, and it was found that resistance to rotenone and nicotine could be controlled to a very large extent by artificial methods of rearing, especially in the quantity or concentration of food supplied."

**Keys to the parasites of the hessian fly based on remains left in the host puparium,** C. C. HILL and J. S. PINCKNEY (*U. S. Dept. Agr., Tech. Bul. 715 (1940), pp. 24, pls. 5, figs. 5*).—Keys to the hymenopterous parasites of the hessian fly based upon systematic rearings of hessian fly material for more than 20 yr. and used extensively by the authors for a number of years are presented. They have proved an invaluable aid in gaging the extent of parasitization by the different species, their relative importance in biological control, and their geographical distribution. The keys make possible the identification of 20 species of hymenopterous parasites of this pest based on remains left in the host puparium after the parasite has emerged. These species include only those found in the United States east of the Rocky Mountains and 3 which were introduced for colonization. Pupal casts, meconia, and larval exuvia were used in the keys to aid in identification. The terms used to designate the pupal sclerites were adopted as far as possible from those corresponding structures of the adult, although in some instances it was found expedient to use composite descriptive terms. The keys are also useful as a means of rapid determination where distinguishing characteristics of the adult are not readily discernible.

**The Syrphidae of Minnesota,** H. S. TELFORD (*Minnesota Sta. Tech. Bul. 140 (1939), pp. 76, pls. 2*).—The first part of this contribution on the diptera of the family Syrphidae, the larvae of which are of major importance as predaceous enemies of plant lice, briefly considers their general biology, economic importance, and natural enemies. Then follows a biological summary and synoptic review of the Syrphidae of Minnesota. A key is given to the 9 subfamilies, as are keys for the separation of the genera of these subfamilies and to the species of most of the genera. The 135 species recorded from Minnesota, their synonymy and occurrence in the State, are noted. A 10-page list of references to the literature and an index to the genera and species are included.

**A new North American species of Asteia (Diptera, Asteiidae),** C. W. SABROSKY. (Mich. Expt. Sta.). (*Pan-Pacific Ent., 15 (1939), No. 4, pp. 165–167, fig. 1*).—Under the name *A. multipunctata*, a description is given of a new dipteron that has been collected from British Columbia to New Mexico.

**Carcass temperatures and their relation to winter blowfly populations and activity in the Southwest,** C. C. DEONIER. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 166–170*).—In observations made in southwestern Texas during the winters of 1935-36 and 1936-37, carcasses showed tempera-

tures considerably higher than the atmosphere. Such temperatures were due partially to heat absorbed from the sun but principally to heat generated by blowfly larvae which were developing in the carcasses. "Temperatures 70° F. above those of the atmosphere were observed in certain parts of carcasses and more than 50° above in larval masses. The heat generated by blowfly larvae in carcasses enables the larvae to continue to develop and the species to survive periods when weather conditions are unfavorable to adult activity. Observations on the minimum temperatures at which various species of blowflies become active about carcasses showed that 40° to 50° is the range for *Cynomya cadaverina* Rob.-Desv., 50° to 55° for *Lucilia sericata* Meig., and 50° to 60° for certain carcass-breeding species of *Sarcophaga*, 40° to 50° for *Calliphora* spp., 41° to 50° for *Phormia regina* Meig., and 55° to 60° for *Cochliomyia macellaria* F. The influence of other factors, such as cloudiness, humidity, wind, and time of day, probably determines the range of the minimum temperatures at which blowflies become active. In small carcasses, such as those of jackrabbits, lambs, cats, and small dogs, blowfly larvae were not able to generate and maintain heat sufficiently above atmospheric temperatures during the winter to afford favorable conditions of development."

**The basis for treatment of products where fruitflies are involved as a condition for entry into the United States,** A. C. Baker (*U. S. Dept. Agr. Cir. 551 (1939), pp. 8, figs. 7*).—An account is given of methods of study and the character of experiments which form the basis for treatments of fruitfly-infested products. The experiments conducted were aimed at the destruction of all eggs and larvae in the products treated and a decrease in the treatment required insofar as possible. The two types of treatments discussed in illustration involve (1) the refrigeration method of sterilization or use of low temperatures and (2) the vapor-heat method of sterilization or use of high temperatures. The results obtained in experiments with the Mediterranean fruitfly are summarized in chart form, as follows: The mortality (1) of 136,131 larvae in fruit held at 32° F. has shown 12 days at this temperature to be necessary for assured total destruction, (2) of 78,190 larvae in fruit held at 33° to require 13 days at 33°, (3) of 56,212 larvae in fruit (other than kamani nuts) held at 34.5° to require 14 days at 34°, (4) of 90,826 larvae held at 36.5° to require 16 days at 36°, (5) of 110,873 larvae held for 8 hr. at 110° to require 8 hr. at 110°, and (6) larvae in kamani nuts held at 35° to require 15 days at 35° for assured total destruction. The mortality of 72,213 larvae of the melonfly held at 35° revealed 15 days at 35° to be necessary for assured total destruction.

**Two new species of Acmaeodera from California (Coleoptera, Buprestidae),** P. H. Timberlake. (Calif. Citrus Expt. Sta.). (*Pan-Pacific Ent., 15 (1939), No. 4, pp. 179–182*).—*A. perlanosa*, taken on *Eriodictyon crassifolium* and *E. traskiae* near Palm Springs and Sunset Valley, Calif., and *A. palmarum* found on *Dicoria canescens* near Palm Springs, Calif., are described as new.

**The discovery of an alfalfa weevil, Hypera brunneipennis Boheman, in Arizona,** L. P. Wehrle. (Univ. Ariz.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 119–121*).—This reports upon the appearance of *H. brunneipennis* in Arizona, earlier accounts of which have been noted (E. S. R., 82, p. 364).

**Forest trees and shrubs of Michigan for bee pasturage,** M. E. Deters (*Michigan Sta. Quart. Bul., 22 (1940), No. 3, pp. 186–189*).—This brief discussion of 65 forest trees and shrubs which furnish nectar and pollen to honeybees presents detailed tabulated information as to the scientific and common names, whether nectar or pollen pasturage, approximate date of blooming, relative value, and range in Michigan.

**Studies of factors affecting package bees,** J. E. ECKERT. (Univ. Calif.). (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 77–81*).—The data presented with a detailed record of colonies held under observation during the years 1935-38, inclusive, made it quite evident that the variation in the relative productivity of the queens and their colonies was far more important than the actual supersedure of queens. It is apparent that queen bees and "their colonies are just as variable in physical potentialities as are other animals. No two are exactly alike in all characteristics, and in the case of the honeybee there is the uncontrollable factor of mating that makes for wide variations within any given strain. Consequently, the problem of the queen breeder is to improve his methods of queen-rearing continually so as to eliminate undesirable characteristics and to breed for high uniformity in production. The honey producer can assist by returning to the queen breeder queens having the most desirable characteristics leading to high yields by maintaining conditions that will tend to promote the greatest aggregate production. Improved methods at the time of installing package bees, such as the feeding of warm sirup to assist the bees in warming up the cold hives, will reduce the ill effects of exposure to cold on queens and worker bees. The most important symptom preceding the supersedure of queens is the presence of some drone brood in worker cells. This may occur soon after the packages are installed but may not appear until several weeks later. The cause of this failure of queens is not indicated."

**Larval pests common to nests of bumblebees and combs of the honeybee,** V. G. MILUM (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 81–83*).—This contribution relates particularly to the pyralid moth *Vitula edmandsii* Pack., a form closely related to the Mediterranean flour moth and found feeding in neglected honeybee combs in Nebraska. It has been reported infesting comb honey in storage in Colorado and as a pest of bumblebee nests in Indiana, Illinois, and New York. Mention is also made of several species found to feed on honeybee combs or in bumblebee nests.

**Field biology and environmental relationships of the Gulf coast tick in southern Georgia,** H. HIXSON (*Jour. Econ. Ent., 33 (1940), No. 1, pp. 179–189, figs. 2*).—The results of studies of the Gulf coast tick conducted in southern Georgia are reported in table and chart form.

## ANIMAL PRODUCTION

**[Livestock investigations in Arkansas],** N. W. HILSTON, W. R. HORLACHER, P. L. KELLY, D. G. CARTER, R. M. SMITH, and S. R. JOHNSON (*Arkansas Sta. Bul. 386 (1940), pp. 49–56, 57–63*).—Studies, for which results are briefly reported, include: Yields from various silage crops, the relative palatability and nutritive value of these silages for beef calves, the manganese requirement of sheep and of swine, the use of cottonseed meal for pregnant and lactating sows, a comparison of various cereal crops as winter pastures for swine, the comparative market value of early and late lambs, the synthesis of milk fat in the bovine mammary gland, the comparative cost of ice and electric refrigeration for cooling milk, cross-breeding chickens for broiler production, pullet eggs v. hen eggs for broiler production, the development of economical broiler rations, physiological factors influencing the size of the egg in the domestic fowl, and a comparison of the rate and economy of egg production for pullets in insulated and uninsulated poultry houses.

**[Livestock investigations in Delaware],** A. E. TOMHAVE, M. W. GOODWIN, and G. L. SCHUSTER (*Delaware Sta. Bul. 220 (1939), pp. 14–18, 18, 19*).—Included are brief progress reports on the relation of input to output in milk production (coop. U. S. D. A.); rape v. sweetclover as forage crops for pigs; a comparison

of tankage, dried distillers' grains, and dried brewers' grains as protein supplements for growing fattening pigs; a comparison as to protein and carotene contents of artificially dried grass and naturally cured hays; breeding poultry for high viability; the influence of protein level in the ration of growing chicks on feather development; the increased returns from artificial lighting for laying pullets; and the optimum protein levels in the rations for broilers.

**[Livestock investigations in New Mexico]** (*New Mexico Sta. Rpt. 1939, pp. 34–40, 68, 69, figs. 4*).—Reports of progress (E. S. R., 81, p. 825) are presented for studies on the carrying capacity of ranges, the calcium and inorganic phosphorus in the blood of range cattle, the effects of various crossbred matings on the production of wool and lambs of range sheep, the rate of increase or decrease of pingue on grazed and protected areas, the composition of range grasses and browse gathered at varying stages of maturity, the amount of cottonseed meal necessary to supplement hegari fodder and hegari grain in lamb fattening rations, and battery cages v. pen management of laying pullets.

**[Animal nutrition investigations in Wisconsin]**, E. J. Schantz, C. A. Elvehjem, E. B. Hart, H. D. Anderson, W. H. Peterson, A. C. Dornbush, E. J. Stoltz, V. Stormer, C. Kuehn, B. C. Johnson, G. Bohstedt, F. W. Duffee, W. A. King, B. H. Roche, I. W. Rupel, H. Steenbock, P. H. Phillips, J. M. Fargo, M. I. Wegner, R. J. Evans, E. Hove, G. Q. Kohler, S. B. Randle, A. Arnold, J. M. McKibbin, A. I. Coombes, W. Wisnicky, R. W. Engel, F. M. Strong, E. E. Snell, E. E. Feeney, J. B. Christiansen, J. G. Halpin, A. C. Wiese, D. W. Woolley, H. A. Waisman, and H. J. Deobald (*Wisconsin Sta. Bul. 446 (1939), pp. 24–29, 30–40, 44, 45, 46, 48, 49, figs. 6*).—Studies for which results are reported include the comparative nutritive values of whole milk and filled milk with added vitamins, mineralized whole milk as a sole diet for animals, the influence of grass silage in dairy rations on the nutritive value of milk, methods for ensiling grasses and legumes, nutritive factors required to prevent "sickle hock" paralysis in pigs, the utilization of urea by ruminants and its stability in feeds, the fluorine tolerance of various species of animals, the role of boron and zinc in animal nutrition, the nature of and important sources of the grass juice vitamin, the nutritive factors required to prevent running fits in dogs, the requirements of dogs for vitamins of the B complex, the nutritive requirements of fur animals, riboflavin as a preventive of "curled toe" paralysis in chicks, the effect of riboflavin deficiency on hatchability of eggs, a bacteriological method for riboflavin assay, the influence of manganese supplement and sunlight on the hatchability of winter eggs, the utilization of manganese by perotic chicks, factors affecting the blood calcium level in pullets, the identity of the chick antidermatitis vitamin, and the value of various animal proteins as a supplement to soybean oil meal rations for chicks.

***Advances in vitamin nutrition***, W. E. Krauss. (Ohio Expt. Sta.). (*Flour & Feed, 40 (1940), No. 9, pp. 8, 9, 31*).—A general résumé.

**Results of alfalfa grass molasses silage experiments at the Upper Peninsular Experiment Station**, B. R. Churchill (*Michigan Sta. Quart. Bul., 22 (1940), No. 3, pp. 193–199, fig. 1*).—In a further report of these investigations (E. S. R., 76, p. 679), data are presented on the moisture, protein, soluble carbohydrate, and carotene contents of a number of legume-grass silages produced over a period of years. In general, there was little loss of protein during the ensiling period, the protein content generally averaging higher when the silage was fed than when the crop was ensiled. A sharp decline in soluble carbohydrates occurred in all cases. A considerable amount of carotene was lost during the storage period, but the carotene content of silage was still several times greater than that found in hay. A moisture content of from 60 to 70 percent was found to be most satisfactory.

**The spraying of rough herbage with molasses**, A. W. LING (*Univ. Bristol, Dept. Agr. and Hort. Bul. 22 (1939), pp. 11, figs. 3*).—In a series of preliminary trials, molasses diluted with water in a ratio of 1:3 was sprayed on various types of rough unpalatable herbage at the rate of 1½ cwt. of molasses per acre. Adjacent control areas received an application of salt at the rate of 4 cwt. per acre. On three of the five treated areas the molasses treatment markedly encouraged grazing of the herbage by cattle, while less favorable response was obtained in the other two cases. In only one case did the application of salt encourage grazing to any appreciable extent. Certain modifications of the method of applying molasses are suggested.

**The influence of climate on cattle**, J. C. BONSMA, G. D. J. SCHOLTZ, and F. J. G. BADENHORST (*Farming in So. Africa, 15 (1940), No. 166, pp. 7–12, 16, figs. 5*).—In addition to a general discussion, data are presented indicating that as atmospheric temperature rises above 80° F. it has a direct effect on the body temperature and respiration of exotic beef breeds, including the Hereford, Aberdeen Angus, and Shorthorn, but that it has little effect on Africander cattle or on $F_1$ Shorthorn × Africander crossbreds.

**Rations for finishing steer calves in dry lot**, C. C. CULBERTSON, P. S. SHEARER, M. D. HELSER, F. J. BEARD, and B. H. THOMAS (*Iowa Sta. Rpt. 1939, pt. 2, pp. 75–78, fig. 1*).—Brief results are presented for a comparison of whole corn fodder, recut corn fodder, ground corn fodder, and corn silage in the rations for fattening steer calves.

**Karakul sheep breeding experiments at the Agricultural Research Center, Beltsville, Maryland**, D. A. SPENCER. (U. S. D. A.). (*Amer. Fur Breder, 12 (1940), No. 8, pp. 31, 32*).—A brief progress report. Data are presented to indicate that it is possible to evaluate the fur on the living lambs or in the raw state with a fair degree of accuracy.

**Quality lamb production**, C. W. McDONALD (*Iowa Sta. Bul. P4, n. ser. (1940), pp. 149–180, figs. 14*).—Practical suggestions are offered for the establishment, feeding, and management of the sheep breeding flock and for the care and fattening of lambs, including sections on ailments, parasites, and diseases.

**Hybrid and open-pollinated corns for pigs**, W. L. ROBISON (*Ohio Sta. Bimo. Bul. 201 (1939), pp. 156–163*).—The results of seven feeding trials, comparing open-pollinated and hybrid corns for pigs, are summarized. In each instance the corns compared were grown on the same farm and under similar conditions, and the corn and supplement were fed at a definite ratio. With open-pollinated corn assigned a value of 100 percent, hybrid corns had relative values ranging from 90.4 to 107.7 percent, with an average of 97 percent for the seven comparisons. In free-choice feeding tests, in which pigs had access to each of eight corns used in the second year's trials, definite differences in palatability were evident. These results did not particularly favor either type of corn, but rather indicated that corn of the lowest moisture content was most palatable and that of highest moisture content least palatable.

**Morphologic changes in the blood of pigs associated with deficiency of water-soluble vitamins and other substances contained in yeast**, M. M. WINTROBE, M. SAMTER, and H. LISCO. (Coop. U. S. D. A. et al.). (*Bul. Johns Hopkins Hosp., 64 (1939), No. 6, pp. 399–423, pl. 1, figs. 2*).—In a further report of these investigations (E. S. R., 80, p. 382), observations were recorded on the blood, gastric secretion, and bone marrow of young pigs receiving various components of the vitamin B complex. Anemia did not develop in young pigs receiving 3 gm. or more of yeast per kilogram of body weight daily but did occur in most cases where smaller amounts of yeast were fed. Of four pigs given thiamin chloride as the only supplement in place of yeast, slight anemia devel-

oped in three cases and severe anemia in one. Of five pigs receiving thiamin chloride plus riboflavin, slight anemia developed in three cases and little or none in the other two. When pigs received nicotinic acid in addition to thiamin alone or thiamin plus riboflavin, moderate to severe anemia developed in all cases. The anemia was characterized by the presence of macrocytes, polychromatophilia, Howell-Jolly bodies, and nucleated red cells. The mean size of the red corpuscles was not generally affected, but in several instances macrocytic anemia occurred. Yeast therapy resulted in reticulocytosis and partial or complete recovery from anemia, but both crude and purified liver extracts were ineffective in this respect.

**The relation of nutrition to the development of necrotic enteritis in swine,** G. K. DAVIS, V. A. FREEMAN, and L. L. MADSEN (*Michigan Sta. Tech. Bul. 170 (1940), pp. 23, figs. 6*).—The results secured from six separate experiments gave evidence that necrotic enteritis of swine develops primarily as a result of nutritional deficiency. In a study of the specific effect of individual grains, more pigs were affected with this disorder when fed a basal ration of yellow corn than when fed barley, while intermediate numbers were affected when fed wheat or oat groats. Additions of liver, yeast, and particularly nicotinic acid to the ration of pigs severely affected with this disorder exerted remarkable curative effects. The supplements also were found to be effective in preventing this disorder. Rations supplemented with nicotinic acid prevented the development of necrotic enteritis in the same environment where pigs fed the same ration without supplement developed the disease. It remains to be demonstrated whether nicotinic acid will prevent the development of necrotic enteritis in the presence of massive infection of *Salmonella choleraesuis*.

**Feeding, care of jacks, stallions,** R. H. MEANS and V. R. BERLINER (*Miss. Farm Res.* [*Mississippi Sta.*], *3 (1940), No. 2, p. 2*).—Practical recommendations are offered.

**The feeding of chickens,** H. W. TITUS (*U. S. Dept. Agr., Farmers' Bul. 1841 (1939), pp. II+22, figs. 4*).—This supersedes Farmers' Bulletin 1541 (E. S. R., 58, p. 669).

**Rations and methods of feeding layers,** D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul. 201 (1939), pp. 149–153*).—Three feed mixtures and four methods of feeding were employed in a trial involving six pens of White Leghorn pullets and extending over a period of 42 weeks. Pens 1, 2, and 5 received a 22-percent protein mash and free choice of whole corn and whole oats. Grain was unrestricted for pen 1, but allowed for only 2 hr. daily to pens 2 and 5. In addition pen 5 received a supplement of dried skim milk fed in the mash. Pens 3 and 4 received a 32-percent protein mash and free choice of corn and oats, the grain being restricted to 2 hr. daily for the latter. Pen 6 received unrestricted access to a whole oats-mash mixture containing 17.3 percent protein. On the basis of total feed consumed, the protein contents of the rations for pens 1 to 6 averaged 14.7, 15.3, 15.2, 16.3, 16.4, and 17.3 percent, respectively, indicating that the hens have a remarkable ability to balance their diets properly with respect to protein content. Total egg production ranged from 152 eggs per bird in pen 3 to 173 eggs per bird in pen 6. Feed consumption per dozen eggs produced ranged from 4.9 lb. in pen 1 to 5.25 lb. in pen 4, and returns from eggs over cost of feed per bird ranged from $1.83 in pen 4 to $2.18 in pen 6. There was no significant difference in rates of mortality for the various groups, and the body weight of layers was similar in all cases. Apparently any of the methods, with the possible exception of No. 4, may be safely recommended.

**A comparison of carrots, "Greenmelk," and dehydrated alfalfa leaf meal in the laying ration,** J. G. Wells, Jr., and J. A. Davidson (*Michigan Sta. Quart. Bul., 22 (1940), No. 3, pp. 199–203*).—In trials extending over a period of 6 mo., three pens of laying pullets received as supplements to a simple mash ration devoid of corn (1) 8 percent of dehydrated alfalfa leaf meal, (2) 2 lb. of Greenmelk per 100 birds, and (3) from 5 to 10 lb. of freshly cooked carrots daily per 100 birds. There was so significant difference in the egg production of the three lots. Mortality was lowest for the carrot-fed group. The liver storage of vitamin A was highest in the carrot-fed group, averaging approximately twice that of the Greenmelk group and four times that of the alfalfa meal group. It appeared that from 4 to 5 lb. of carrots daily per 100 birds provided an adequate amount of vitamin A and that this product was a satisfactory substitute for alfalfa products in the laying ration during the winter feeding period.

**Fat requirement of poultry,** W. C. Russell (N. J. Expt. Stas.). (*Flour & Feed, 40 (1940), No. 9, p. 10*).—Brief summaries are presented for experiments on the fat requirements of the growing chick; fat balances of laying and nonlaying pullets on low-fat and normal rations; egg production on a high-fat ration; the plasma lipids of pullets on low-fat, normal, and high-fat rations; and the absorption and utilization of carotene and the absorption of molecular vitamin A by pullets on normal and low-fat rations.

**Relation of gain in weight to gain in energy content of growing chicks,** G. S. Fraps and E. C. Carlyle. (Tex. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 10, pp. 777–781*).—In the series of chick growth experiments described, a number of feeds, including patent flour, low-grade flour, wheat bran, wheat brown shorts, corn bran, casein, starch, Wesson oil, oat hulls, and kafir grain, were used to partially replace corn meal in the basal ration. Feed consumption and growth data were recorded, and at the end of the experimental periods (usually 21 days) the chicks were analyzed and their energy content estimated. Assigning values of 100 to the amount of feed required per gram of gain and per calorie of gain on the basal ration, the relative quantities of feed required per unit of gain in live weight on the other rations was different from that required per calorie of gain. For example, in two experiments in which casein replaced corn the quantities required per unit of gain in weight were 97 and 111, whereas the requirement per unit of gain in energy was 147 and 166. In two experiments in which Wesson oil replaced corn the relative requirements per unit of gain in weight were 111 and 113, while comparable quantities per unit of gain in energy were 84 and 95. These findings emphasize the fact that the feed required per unit of gain in live weight is not a safe standard for comparing the feeding values of rations.

**The effect of feeding varying levels of fish meal on egg flavor,** E. I. Robertson and L. A. Wilhelm. (Wash. Expt. Sta.). (*U. S. Egg and Poultry Mag., 46 (1940), No. 2, pp. 104, 105*).—Three groups of pullets were fed, respectively, a complex ration, a low-protein basal ration plus 4.3 percent of salmon fish meal, and the basal ration plus 28 percent of salmon meal. Eggs from each lot were examined while fresh and after 60 days' storage at 34° F. and after 38 days' storage in an egg humidor at 50°. No differences in flavor or odor could be detected in comparable lots of eggs from hens fed on the three rations.

**Egg candling and yolk quality,** R. Coles (*U. S. Egg and Poultry Mag., 46 (1940), No. 2, pp. 92–95, figs. 3*).—This discussion deals with two types of abnormal yolk positions as observed under the candle. One is designated as "heavy yolks," i. e., yolks which are off-center and near the shell, and the other as "sunken yolks," i. e., yolks which appear to have settled in the point of the

shell. Two lots of each type of abnormal eggs were studied, one lot of each type being held in storage while the remaining lots were packed and shipped a considerable distance and then stored. Examination of all the eggs after 14 days revealed that 29 percent of the sunken-yolk and 23 percent of the heavy-yolk eggs not transported were of No. 1 quality, while in the transported lots only 10 and 17 percent, respectively, were of the top grade. From these results it is concluded that candling with regard to the grading of yolks was unsatisfactory and probably accurate only to within about 60 percent. It is estimated that roughly 50 percent of eggs that are truly sided show rapid deterioration during transit.

**Detection of fertility in eggs**, A. L. Romanoff. (Cornell Univ.). (*U. S. Egg and Poultry Mag., 46 (1940), No. 2, pp. 106–108, figs. 8*).—A brief résumé, with particular reference to experiments reported elsewhere (E. S. R., 82, pp. 380, 527).

**Capons**, G. P. Goodearl (*North Dakota Sta. Bimo. Bul., 2 (1940), No. 3, pp. 14–18*).—In addition to a general discussion of capon production, data are presented on the growth rate and feed consumption of capons from both early- and late-hatched chicks of the Rhode Island Red and Jersey White Giant breeds. Early Rhode Island Red cockerels and capons grew at a similar rate and reached the same average weight at 30 weeks of age. However, the capons required considerably more feed per unit of gain. The Jersey White Giant capons grew more rapidly and utilized feed more efficiently than those of the Rhode Island Red breed. Neither the early-hatched nor the late-hatched groups showed a consistent advantage in economy of feed utilization, total consumption at 30 weeks of age favoring the early-hatched Rhode Island Reds and the late-hatched Jersey White Giants. After 26 weeks of age increase in weight was so slow that the feed requirement per unit of gain was exceedingly high for all lots.

**The use of vegetable protein concentrates for raising turkeys**, E. M. Funk and H. L. Kempster (*Missouri Sta. Bul. 414 (1940), pp. 27, figs. 11*).—In a series of experiments with Bronze turkey poults cottonseed meal, corn gluten meal, and soybean oil meal were compared as protein supplements to a basal ration containing cereal ingredients, alfalfa leaf meal, salt, cod-liver oil, 10 percent meat scrap, and 5 percent dried skim milk. The vegetable proteins were used to the extent of 10 percent of the total ration in all cases. Cottonseed meal and corn gluten meal were of equal value as protein supplements for starting and growing turkeys, while soybean oil meal was superior to either of them on the basis of growth rate and on the grade of the live birds and dressed birds. Also feather pigmentation was normal on the soybean oil meal ration, while rations containing either cottonseed meal or corn gluten meal produced feathers containing an abnormal amount of white. Soybean oil meal also possessed definite antiperosis properties not contained in corn gluten meal. The addition of bonemeal to the rations increased the incidence of slipped tendon, as did also the addition of manganesed calcium to the corn gluten meal rations, while the addition of manganese sulfate reduced cases of slipped tendon to a minimum. Late-hatched turkeys grew more slowly than early-hatched birds during the early weeks of life, but the return of cooler weather tended to overcome this retardation and to bring normal size at market age. The average feed required to produce 1 lb. of gain increased from 2.67 lb. during the first month to 7.35 lb. for the seventh month.

## DAIRY FARMING—DAIRYING

**Carotene and vitamin A in the nutrition of growing dairy cattle**, R. E. Ward, S. I. Bechdel, and N. B. Guerrant. (Pa. Expt. Sta.). (*Jour. Dairy Sci.,*

23 (*1940*), *No. 2, pp. 115–124, fig. 1*).—In the first phase of this experiment Holstein calves fed a low carotene basal ration received in addition mixtures of mow-burned brown alfalfa hay and good quality dehydrated alfalfa to provide a rather wide range of carotene intakes. From the response of calves to these several rations, it is concluded that the minimum carotene requirement of growing calves is 11 $\mu$g. per day per pound of body weight. Increasing the intake above that level did not result in any marked improvement in growth rate. In a second phase, to determine the availability of carotene from various sources, a carotene concentrate provided the most available supply, followed in order by alfalfa hay, corn silage, corn meal, timothy hay, and alfalfa-molasses silage.

**Causes for cow removals in Michigan herds under test in dairy herd improvement associations**, A. C. Baltzer (*Michigan Sta. Quart. Bul., 22 (1940), No. 3, pp. 147–153, fig. 1*).—An analysis of dairy herd improvement association records revealed that during the 6 yr. studied an average of 19 percent of all cows in these herds were removed annually because of unsatisfactory performance. A classification of the causes of removal showed low production to be first with 52 percent, followed by Bang's disease 13, udder trouble 11, sterility 7, death 5, old age 3, bloat 1, and all other causes 7 percent. Variations in the relative importance of these causes in different sections of the State are indicated.

**Milk goat improvement** (*New Mexico Sta. Rpt. 1939, pp. 47–49*).—The effects of inbreeding and outbreeding on the production of purebred milk goats are briefly summarized.

**The effect of continued treatment with anterior pituitary extracts on milk volume and milk-fat production in the lactating cow**, S. J. Folley and F. G. Young (*Biochem. Jour., 33 (1939), No. 2, pp. 192–197, figs. 5*).—The experiments described were conducted at the National Institute for Research in Dairying, England, with dairy Shorthorn cows in declining lactation. In one group each cow received on alternate days an injection of 30 cc. of a prolactin preparation, equivalent to 10 gm. of fresh anterior lobe tissue; the cows in a second group received similar injections of a thyrotropic preparation; while the control group was injected with 30 cc. of a saline suspension of fresh ox liver, equivalent to 10 gm. of fresh tissue. The repeated injections of the prolactin and thyrotropic preparations resulted in a pronounced increase in milk yield, the increase being more marked with the former. Also injections of the prolactin caused a marked increase in the butterfat content of the milk during a period of five successive injections. When the prolactin treatment was continued through 12 successive injections, milk yield did not continue to increase but reached a level and then declined despite continued treatment.

**[Abstracts of papers presented at the forty-first general meeting of the Society of American Bacteriologists]** (*Jour. Bact., 39 (1940), No. 1, pp. 88, 89, 90, 93, 94, 95, 96*).—Abstracts of the following papers of significance in dairying are noted: The Commercial Fermentation of Lactose in Whey to Lactic Acid, by L. A. Rogers and E. O. Whittier (U. S. D. A.); Fermentation Studies on Silages Prepared by the Phosphoric Acid and Molasses Methods, by H. D. McAuliffe, R. W. Stone, and S. I. Bechdel (Pa. State Col.); Studies on Staphylococci of Bovine Origin, by L. W. Slanetz and H. P. MacLeod (N. H. Expt. Sta.); Influence of Various Operations at the Pasteurizing Plant on Microscopical Counts of the Bacteria in Milk, by A. R. Ward; The Isolation, Cultivation, and Nature of "Primitive Forms of Bacteria" in Milk and Milk Products, by L. A. Black and H. J. Brueckner (Univ. Md. and Cornell Univ.); and Adaptability of Thermophilic Lactic Acid Bacterial Cultures to Certain Environmental Conditions, by L. A. Burkey and M. Rogosa (U. S. D. A.).

**[Investigations with dairy products in Wisconsin]**, W. V. Price, H. J. Peppler, W. C. Frazier, E. M. Foster, J. C. Garey, W. Langhus, L. C. Thomsen,

A. M. Swanson, H. H. Sommer, H. Tranmal, K. G. Weckel, H. C. Jackson, and H. Lauffer (*Wisconsin Sta. Bul. 446 (1939), pp. 59–68*).—Results are briefly reported for the following studies: Factors involved in the control of the fat content of Swiss cheese; methods for preparing, storing, and using Swiss cheese starters; desirable starter combinations for brick cheese; the optimum butterfat content of cream for buttermaking; the use of propionic acid or propionates in buttermaking; the effect of treating parchment wrappers with oat flour on the keeping quality of storage butter; various uses for sodium alginate in dairy manufacturing; an improved test for determining the efficiency of pasteurization of milk and cream; and the lecithin content of foremilk, middle milk, and strippings.

**The measurement of the yellow color of milk**, O. F. Garrett, H. H. Tucker, and F. J. Nuissl (*New Jersey Stas. Bul. 671 (1939), pp. 19, figs. 8*).—A detailed description of the construction, standardization, and operation of the lactochrometer, a new instrument for measuring milk color, is set forth. The relative merits of this instrument and of the Wood and Pfund milk color graders are discussed, and conversion tables for converting the reading of one instrument to those of the other two are included. Tests on the new instrument indicated that its accuracy is sufficient for routine research work. It arithmetically measures the color of the milk over the widest range obtainable under the conditions studied. It can be used for standardizing the color of a mixture of whole milks, but failed for whole milk mixed with skim milk.

**Effect of alfalfa-bromegrass pasture on the flavor of milk when the cows are milked three times daily**, G. M. Trout, C. R. Megee, and C. M. Harrison (*Michigan Sta. Quart. Bul., 22 (1940), No. 3, pp. 168–174*).—This report describes a case in which cows grazing on succulent alfalfa-bromegrass pasture and being milked three times daily produced milk having a pronounced off-flavor. This defect was described as alkaline, sodalike, or neutralizer taste and bore little resemblance to ordinary feed flavors. The off-flavor decreased in intensity but still persisted as pasturing advanced. When the cows were kept off pasture for 7 hr. prior to milking, no off-flavor occurred in milk, and such off-flavors did not occur in the milk of cows grazing this pasture but milked twice daily. Apparently the alfalfa contributed more to off-flavor than did the bromegrass.

**The antioxidative action of finely milled oat flour on milk**, O. F. Garrett. (N. J. Expt. Stas.). (*Milk Plant Mo., 29 (1940), No. 2, pp. 40, 42, 80*).—The results of five separate experiments are summarized. The direct addition of 0.5 percent of oat flour to milk markedly retarded the development of oxidized flavor, even in the presence of a high copper contamination. However, a distinct oat-flour flavor was imparted to the milk. Treating paper containers with oat flour or oat oil retarded the development of oxidized flavor induced by copper contamination or exposure to sunlight. Treating the paper stock with oat flour prior to fabricating and paraffining proved superior to spraying the walls of the bottle with oat flour while the paraffin was in a melted condition.

**The sanitary aspects of packaging milk and milk products**, M. J. Mack et al. (*Milk Plant Co., 29 (1940), No. 2, pp. 36–39*).—A report of the milk and milk products committee of the American Public Health Association.

**The effect of riboflavin and of certain synthetic flavins on the growth of lactic acid bacteria**, E. E. Snell and F. M. Strong. (Wis. Expt. Sta.). (*Enzymologia, 6 (1939), No. 3, pp. 186–193, figs. 2*).—Attempts were made to grow 11 species of a lactic acid bacteria on a riboflavin-free culture medium. Seven of the 11 species, i[...] found not to require riboflavin for growth [...] 4 of these species synthe-

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sized riboflavin when cultured on the flavin-free medium. The 4 species requiring riboflavin included *Lactobacillus casei* and *B[acillus] lactis acidi*. The response of these 2 species to a number of synthetic flavins paralleled rather closely the effect of these same flavins on the growth of rats, suggesting the possibility of using bacteriological tests for checking the biological activity of flavins. Thirteen flavin compounds are classified into three groups, i. e., those supporting growth as the sole source of flavin, those possessing detectable activity only in the presence of suboptimal amounts of riboflavin, and those possessing no detectable activity under any of the conditions tested.

**Examples of variation within pure cultures of Streptococcus cremoris,** G. J. E. HUNTER (*Jour. Dairy Res. [London], 10 (1939), No. 3, pp. 464–470*).—Evidence of variability within pure strains of *S. cremoris* is presented. Variation was well marked in some strains, especially in regard to acid production, response to high temperature conditions, power to produce ropiness in milk, and degree of resistance to phage attack.

**Effect of salt on the microflora and acidity of cream,** D. I. THOMPSON and H. MACY. (Minn. Expt. Sta.). (*Natl. Butter and Cheese Jour., 31 (1940), No. 2, pp. 12–14*).—Two lots of fresh cream, one representative of good cream and the other of questionable quality, were subdivided, and salt was added in concentrations of 5, 7.5, and 10 percent. These were further subdivided, and the samples were stored at temperatures of 45°, 60°, and from 65° to 70° F. Counts of bacteria, molds, and yeasts, and acidity and pH determinations were made after 1, 3, 5, and 10 days. In general, with increasing salt concentration the growth of bacteria and especially yeasts was effectively checked, and little acidity developed when the cream was held at the lower temperatures. With 7.5 and 10 percent salt even the cream held at the highest temperature for 10 days was not criticized on aroma, except for a slight staleness, while the unsalted samples developed very pronounced aroma defects over this period.

**A study of cream quality from creameries located in southern Michigan,** J. M. JENSEN (*Michigan Sta. Quart. Bul., 22 (1940), No. 3, pp. 203–208*).—A total of 5,925 cans of cream, representing both 3-day and 4-day-old cream, were tested for acidity and graded in this study. Of these 6.7 percent contained less than 0.3 percent acidity, 65.4 ranged from 0.3 to 0.6 percent, and 27 percent exceeded 0.6 percent in acidity. The score of cream was as follows: 24 percent would yield butter scoring 92, 61.2 percent would yield 91 to 90 score butter, and 14.5 percent would yield butter scoring under 90. Thus it is evident that cream cannot be graded entirely by acid test. Atmospheric temperature was an important factor in determining cream quality. In general, cream held for 3 days was of better quality than that held for 4 days.

**1938 Butter and cheese industry symposium** (*New York: Consolidated Rptg. Co., [1939], pp. [1]+III+171, figs. 7*).—This compilation includes the following papers: Butter Color and Vitamin A, by K. G. Weckel (pp. 1–6) (Univ. Wis.); Government Butter Grading, by R. C. Potts (pp. 7–9) (U. S. D. A.); What Needs To Be Done to Increase the Consumption of Butter, by L. C. Thomsen (pp. 10–15) (Univ. Wis.); The Body of Butter, by S. T. Coulter (pp. 16–21) (Univ. Minn.); A Survey of Recent Studies on Butter Manufacture, by S. L. Tuckey (pp. 22–27) (Univ. Ill.); The Effect of Cooling, Churning, and Workmanship on the Keeping Quality of Butter, by O. F. Hunziker (pp. 28–33); Factors Relating to the Keeping Quality of Butter, by O. R. Overman (pp. 49–54) (Univ. Ill.); Sewage Disposal Problems (p. 67) and Chemical Sterilization (p. 68), both by H. Macy, Competitive Problems Among Minnesota Creameries, by E. F. Koller (pp. 69, 70), The Removal of French Weed Flavor From Cream, by W. B. Combs and S. T. Coulter (pp. 71–73) (all Univ. Minn.); The Use of

Starter Distillate in Improving Butter Flavor, by H. A. Ruehe (pp. 76–80) (Univ. Ill.); Preparation and Care of Starters, by W. A. Cordes (pp. 81–98); Essential Steps in Making Starters of High Quality, by W. V. Price (pp. 99–103) (Univ. Wis.); How Can the Quality of Cheese Be Improved, by J. B. Stine (pp. 104–108); The Use of Pasteurized Milk in Cheddar Cheese Manufacture, by H. A. Ruehe (pp. 109, 110) (Univ. Ill.); Notes on Foreign Cheese Investigations, by J. C. Marquardt (pp. 111–115) (N. Y. State Expt. Sta.); Laboratory Tests That Every Cheese Maker Should Know, by B. F. Whitmore (pp. 119–127) (Univ. Ill.); Factors Affecting Flavor, Body, and Texture, by G. Pulkrabek (pp. 128–132); Studies in Development of New Types of Hard Cheese, by E. F. Goss (pp. 142–148) (Iowa State Col.); and Producing Milk for Cheese Making, by H. A. Ruehe (pp. 149–152), and Factory Sanitation, by M. J. Prucha (pp. 153–155) (both Univ. Ill.).

**The estimation of butterfat losses in churning,** W. J. Wiley (*Jour. Council Sci. and Indus. Res. [Austral.], 12 (1939), No. 4, pp. 391–396*).—A critical comparison of methods proposed by W. H. Udy [3] and by Bird and Derby (E. S. R., 78, p. 97) indicated that both methods give results which compared rather closely with those obtained by measuring directly the quantity of fat in the buttermilk and the wash water.

**Changes in diacetyl and acetylmethylcarbinol contents of butter at various temperatures,** E. A. Prill and B. W. Hammer. (Iowa Expt. Sta.). (*Jour. Dairy Sci., 23 (1940), No. 2, pp. 159–168*).—The loss of diacetyl and acetylmethylcarbinol during storage was determined in a series of experimental butters, including both salted and unsalted lots prepared from sweet and from sour cream and with the use of both regular and aerated butter cultures. In general, salted butter made by any of the different manufacturing procedures showed only slight changes in diacetyl or in acetylmethylcarbinol plus diacetyl when held frozen or at 36°–45° F. Even at 70° the contents of these substances were largely retained for a considerable length of time. Changes in the contents of these compounds were relatively slight in frozen unsalted butter, but in samples held at the higher temperatures significant changes occurred, both increases and decreases being recorded.

**Diacetyl and other alpha-dicarbonyl compounds, with special reference to the flavor of butter** (*Iowa Sta. Res. Bul. 268 (1939), pp. 373–403*).—This report is divided into three parts.

I. *Certain properties of diacetyl and other α-dicarbonyl compounds*, E. A. Prill and B. W. Hammer.—In addition to a comprehensive review of the literature, methods for the preparation of a number of representative compounds are described. Certain higher homologs of diacetyl resembled it in odor and other properties, but methylglyoxal and other α-ketoaldehydes and the alicyclic and aromatic diketones differed from it in odor and often in other respects also. Tests are described for differentiating between these various compounds.

II. *Effect of diacetyl, acetylpropionyl, and dipropionyl on flavor of salted butter*, E. A. Prill, N. E. Fabricius, and B. W. Hammer.—To determine the influence of certain higher homologs of diacetyl on butter flavor, acetylpropionyl and dipropionyl were worked into fresh salted butter. Examination of the butter after various holding periods indicated that these compounds imparted a pleasing flavor to butter which was very similar to that contributed by diacetyl although less conspicuous in comparable amounts. Contents of acetylpropionyl and dipropionyl developed in butter through the use of butter cultures were well retained over a considerable period at various temperatures.

[3] New Zeal. Jour. Sci. and Technol., 11 (1929), No. 4, pp. 249–254.

III. *Examination of butter cultures for traces of homologs accompanying diacetyl and acetylmethylcarbinol, by a specially developed method*, E. A. Prill and B. W. Hammer.—Employing the described methods, distillates from ordinary butter cultures gave no evidence of the presence of higher homologs of diacetyl or of methylglyoxal. The importance of the fermentation of citric acid, the mother substance of diacetyl, in the development of flavor in butter cultures and in butter made with starters is emphasized in these findings.

**Relationship of acid number variations to the qualities and flavor defects of commercial butter**, E. L. Fouts. (Okla. A. and M. Col.). (*Jour. Dairy Sci., 23 (1940), No. 2, pp. 173–179*).—Examination of a considerable number of samples of unsalted butter when fresh and after 6 days' storage at 21° C. gave evidence that most samples increased in acid numbers of the fat during this period, while approximately 25 percent of the samples became rancid within the 6 days. No close correlation existed between the acid number of the fat and the quality of such butter, some good-quality samples showing relatively high acid numbers while some rancid samples had relatively low acid numbers. Comparatively few of the samples of commercial salted butter became rancid during a 6-day holding period at 21°.

**Cheese making**, J. L. Sammis (*Madison, Wis.: Cheese Maker Book Co., 1937, 9. ed., rev. and enl., pp. 297, [figs. 115]*).—This is a revised edition of the treatise previously noted (E. S. R., 63, p. 869).

**Effect of salting curd for blue cheese**, C. B. Lane and B. W. Hammer. (Iowa Expt. Sta.). (*Jour. Dairy Sci., 23 (1940), No. 2, pp. 169–172*).—In a series of 10 experimental cheeses manufactured from homogenized milk, one-half of the curds of each lot were hooped without salting, while approximately 2 percent salt was added to the remaining curds before hooping. Data are presented on the mold growth, color, and flavor of 89 comparisons between salted and unsalted lots. Salting the curd in this manner sometimes resulted in better mold growth in the cheese, rather consistently gave a lighter-colored cheese, and generally tended to control certain flavor defects.

**The use of different sugars in sweetened condensed skim**, G. J. Edman. (Univ. Ill.). (*Natl. Butter and Cheese Jour., 31 (1940), No. 2, pp. 15, 42, 44*).—In addition to a discussion of the general behavior of sugars in sweetened condensed milk, recommendations are offered by which corn sugar (dextrose) and sweetose (high-conversion corn sirup) may be successfully used to replace up to 50 percent of the sucrose in the preparation of sweetened condensed milk. No particular advantage could be gained from the use of invert sirup in this process.

**Factors influencing the physical characteristics of chocolate milk**, J. G. Brereton, W. B. Combs, and H. Macy. (Minn. Expt. Sta.). (*Milk Dealer, 29 (1940), No. 5, pp. 38, 62, 64, 66, 68, fig. 1*).—Data are presented on the relative viscosity and the sediment values of chocolate milks prepared from 15 commercial chocolate milk preparations. With the exception of one powder and one hot-process sirup, all of these preparations produced a stable chocolate milk. Slow cooling of the chocolate milk in the vat caused cocoa sedimentation in certain of the products which were on the border line of complete stability. Increasing the fat content of the milk decreased cocoa sedimentation when instability resulted with a milk of low-fat content. The temperature of the milk at the time of adding the powder or sirup did not affect stability provided that the agitation was satisfactory and the material did not contain an alginate stabilizer. In another experiment 5 different stabilizers were compared. The minimum amount of stabilizer necessary for complete stability of "Dutch-process" cocoa in the 2-percent pasteurized milk varied from 0.086 to 0.245 percent

of the weight of the milk. The physical state of certain of the stabilizers in water suspension was greatly affected by the presence of relatively low concentrations of certain salts. Also the presence of small amounts of calcium chloride in the milk tended to cause gelation of the alginate stabilizers. In general, chocolate milks prepared with algal stabilizers tended to thicken when aged at 40° F. The relative fineness of cocoa had little influence on stability, providing an adequate amount of stabilizer was used.

**Influence of some mix components upon the texture of ice cream,** W. C. Cole and J. H. Boulware. (Univ. Calif. et al.). (*Jour. Dairy Sci., 23 (1940), No. 2, pp. 149–157, figs. 2*).—The influence of varying the total solids and the ratio of fat to solids-not-fat in ice cream was measured by the organoleptic test, the microscopic examination of ice crystal size, and the dilatometer measurement of rate of freezing. An increase in total milk solids due to increases of either fat or milk solids-not-fat improved the smoothness of the ice cream and tended to decrease the size of the ice crystals. The milk solids-not-fat were found to be more effective than milk fat in governing the formation of small ice crystals. Dilatometer data indicated that the smaller ice crystals formed in samples with a higher proportion of solids-not-fat may be due to their retarding action upon the growth of ice crystals. Increasing the proportion of fat in ice cream had a greater effect upon texture, as judged organoleptically, than it did in reducing ice crystal size or in retarding the growth of ice crystals.

## VETERINARY MEDICINE

**[Work in animal pathology and parasitology by the Wisconsin Station]** (*Wisconsin Sta. Bul. 446 (1939), pp. 10–12, 19, 20, 29, 30*).—The work of the year in this field (E. S. R., 81, p. 104) relates to diseases of fur animals, by W. Wisnicky et al.; internal parasites of the fox, by C. A. Herrick and C. H. Winkler, Jr.; a study of the physiological effects of coccidiosis in chickens and tests with organic sulfur compounds for the prevention and treatment of the affection, by Herrick and S. H. Waxler; and a study of "sweetclover disease" in cattle, by H. A. Campbell, R. Overman, K. P. Link, and W. K. Smith (coop. U. S. D. A.).

**[Studies in comparative physiology and pathology in Japan]** (*Jap. Jour. Vet. Sci., 1 (1939), No. 5, pp. 489–552, pls. 7*).—Contributions here presented (E. S. R., 82, p. 678) are: Studies on the Reproduction in the Mare—V, On the Art of Mating, by S. Sato and S. Hosi (pp. 489–514, Jap. abs. pp. 512–514) (*E. S. R., 82, p. 250*); On the Chemical Components of the Blood of the Swine, by N. Asami and K. Nitta (pp. 515–524, Eng. abs. p. 524); Studies on Contagious Abortion in Sheep—IV, Excretion of *Brucella melitensis* From Naturally Infected Ewes After Abortion, by T. Tazima, S. Ito, Y. Okuno, T. Oyama, and K. Itabasi (pp. 525–538, Eng. abs. pp. 536–538) (E. S. R., 79, p. 245); On a Simplified Method of Staining Acid-Fast Bacteria, by E. Ryu (pp. 539–543, Eng. abs. p. 543); and Notes on Two Cases of Toxoplasmosis Observed Among Raccoon-Dogs in the Vicinity of Sapporo, by K. Hirato (pp. 544–552, Eng. abs. p. 552).

**The virulence of Br. abortus for laboratory animals and pregnant cattle,** A. D. McEwen (*Vet. Rec., 52 (1940), No. 6, pp. 97–106*).—Experiments on the infectivity of strains of *Brucella abortus* for guinea pigs and cattle are described, together with the results of tests on their toxicity for mice, the details being presented in 11 tables. A high infectivity and a high degree of toxicity are regarded as evidence of virulence, and low infectivity and low toxicity have been accepted as evidence of low virulence. It was found that "field strains of *B. abortus* have a common level of virulence that may be

shared by strains kept in the laboratory for several years and repeatedly sub cultivated. A marked reduction of virulence for guinea pigs and mice is ac companied by a great reduction in virulence for pregnant cattle. Nevertheless pregnant cattle inoculated subcutaneously with strains of very low infectivity for guinea pigs and of low toxicity for mice may become infected in the uterus and in the udder, and the strains on recovery from these animals may be fully virulent. A strain of *B. abortus* may be so reduced in virulence that it is unable to cause infection of the uterus or of the udder when inoculated subcutaneously into pregnant cattle. Such a strain may nevertheless become enhanced in virulence by suitable animal passage until it is as virulent as field strains. The repeated subcultivation on laboratory media may have no detrimental effect on virulence. With existing knowledge regarding immunity to *B. arbortus* infection, the immediate problem is that of finding ways and means of vaccinating cattle with living strains of *B. abortus* of as high a degree of virulence as possible without thereby causing an infection of either the uterus or the udder."

**The treatment of Br. abortus infection in guinea-pigs with M & B 693,** F. W. Priestley (*Vet. Rec., 52 (1940), No. 1, pp. 3–5, fig. 1*).—In the two experiments reported, treatment of *Brucella abortus*-infected guinea pigs with M & B 693 (2(*p*-aminobenzenesulfonamido) pyridine) in doses bordering on the toxic limit resulted in a proportion of cures, but the results were not sufficiently encouraging to advocate its trial on any extended scale or in cattle.

**Studies on the photoelectric and volumetric methods for the determination of the density of Brucella abortus antigens,** M. H. Roepke and C. P. Fitch. (Minn. Expt. Sta.). (*Cornell Vet., 30 (1940), No. 1, pp. 1–13, fig. 1*).—Following an account of the calibration of photoelectric instruments, a comparison made of the photoelectric and volumetric methods for the determination of the density of *B. abortus* antigens is reported upon, the details being given in six tables.

**Experiments on contagious abortion: Field immunisation experiments with a vaccine—prepared from strain 45,** A. D. McEwen (*Vet. Rec., 52 (1940), No. 2, pp. 19–23*).—Further data are submitted (E. S. R., 78, p. 851) to show that the vaccination of noninfected animals in infected herds with a living vaccine prepared from the nonvirulent *Brucella abortus* strain 45 confers protection against infection in the field. This protection becomes evident during the second and subsequent years that the animals have been vaccinated. The vaccination of nonreacting adult animals in infected herds is unavoidably attended by the risk of vaccinating infected cattle that are showing no serum agglutinins. A number of abortions due to *B. abortus* infection are, therefore, most likely to occur among the vaccinated, especially during the first year. These are no reflection on the efficacy of the vaccine. Some of the factors governing field trials are discussed.

**Experiments on the hereditary transmission of anaplasmosis by ticks,** C. W. Rees and J. L. Avery. (U. S. D. A.). (*North Amer. Vet., 20 (1939), No. 12, pp. 35, 36*).—Experiments on the hereditary transmission of anaplasmosis by *Dermacentor andersoni*, the tropical horse tick, the American dog tick, and the brown dog tick, are presented in tables. Under the conditions of the experiments the tropical horse tick in all stages did not transmit anaplasmosis. The findings indicate that the adults of *D. andersoni* and the American dog tick are not potential natural vectors of the disease if the larvae and nymphs of these species occur naturally only on rodents. The failure of the brown dog tick to transmit anaplasmosis hereditarily is of interest, since transmission by nonhereditary means has been demonstrated for this species by Rees (E. S. R., 64, p. 556).

**Birds as possible reservoirs of equine encephalomyelitis infection,** C. A. BRANDLY (*North Amer. Vet.*, *21* (*1940*), *No. 2*, *pp. 95, 96*).—This discussion is presented with a list of seven references to the literature relating to the possible avian reservoir sources of equine encephalomyelitis infection.

***Infection of a peacock with Erysipelothrix rhusiopathiae, followed by a*** **case of human erysipeloid,** A. W. GREENER (*Vet. Rec.*, *52* (*1940*), *No. 1*, *p. 8*).—Report is made of the isolation of *E. rhusiopathiae* from the blood stream of a peacock found dead, the organism thus being indicated as the cause of death. "The strain was very virulent for mice and culturally was a 'smooth' form, which according to the literature, is associated with acute cases of disease. The bird's heart was examined by a colleague with bare hands, and 28 hr. later there developed a reddish-purple swelling on the back of the hand accompanied by local itching and some pain. It was followed by lymphangitis, swelling of the axillary glands, and a slight rise of temperature. After a short course of sulfanilamide the lymphangitis and lymphadenitis subsided, but 1 week after the onset there was a recurrence of the symptoms. The following day 25 cc. antiswine erysipelas serum (W. P. R. L.) was given intramuscularly and 5 cc. around the local lesion. Recovery was rapid, and there was no further relapse." It was pointed out that there is a great variation in the virulence of the organism, and that this appears to apply especially to the strains which infect birds.

**Successful transfer of the Lansing strain of poliomyelitis virus from the cotton rat to the white mouse,** C. ARMSTRONG (*Pub. Health Rpts.* [*U. S.*], *54* (*1939*), *No. 52*, *pp. 2302–2305*).—Record is made of the successful transmission of the Lansing strain of poliomyelitis virus, after adaptation to the eastern cotton rat (*Sigmodon hispidus hispidus*), through 12 generations in white mice.

**Relapsing fever: Ornithodoros hermsi, a vector in Colorado,** G. E. DAVIS (*Pub. Health Rpts.* [*U. S.*], *54* (*1939*), *No. 49*, *pp. 2178–2180*).—The argasid tick *O. hermsi* has been found to be a transmitting agent of relapsing fever locally in Colorado in a northern and southern strip of high mountainous country from as far south as northern Park County to at least as far north as Estes Park in Larimer County. While *O. parkeri* is known to be naturally infected with spirochetes and occurs in the sagebrush desert section in the northwestern part of the State, no human cases have been reported therefrom.

**A filter-passing infectious agent isolated from ticks, I–V** (*Pub. Health Rpts.* [*U. S.*], *53* (*1938*), *No. 52*, *pp. 2259–2282*, *fig. 1*; *54* (*1939*), *No. 40*, *pp. 1822–1827*).—Report is made of studies of a filter-passing rickettsialike agent capable of causing infection in man that was isolated from the Rocky Mountain spotted fever tick *Dermacentor andersoni* and is thought to be related to "Q" fever of Australia, for which the name *Rickettsia diaporica* is proposed by Cox. The papers include Isolation From *Dermacentor andersoni*, Reactions in Animals, and Filtration Experiments, by G. E. Davis and H. R. Cox (pp. 2259–2267); Transmission by *Dermacentor andersoni*, by R. R. Parker and G. E. Davis (pp. 2267–2270); Description of Organism and Cultivation Experiments, by H. R. Cox (pp 2270–2276); Human Infection, by R. E. Dyer (pp. 2277–2282); and Further Attempts to Cultivate in Cell-Free Media—Suggested Classification, by H. R. Cox (pp. 1822–1827). This rickettsia was found by Parker and Davis "to survive in, and be transmitted by, nymphal and adult *D. andersoni* that ingested the virus in the larval stage, and to survive through the eggs deposited by infected females and to be transmitted by the progeny."

**The cultivation of Rickettsia diaporica in tissue culture and in the tissues of developing chick embryos,** H. R. Cox and E. J. BELL (*Pub. Health Rpts.* [*U. S.*], *54* (*1939*), *No. 49*, *pp. 2171–2178*).—Observations of the growth of the filtrable infectious agent isolated from *Dermacentor andersoni* (to which the

name *R. diaporica* has been given (see above)) in modified Maitland cultures and in the tissues of the developing chick embryo are reported.

**Rickettsia diaporica: Recovery of three strains from Dermacentor andersoni collected in southeastern Wyoming—their identity with Montana strain 1,** G. E. Davis (*Pub. Health Rpts.* [*U. S.*], *54* (*1939*), *No. 50*, *pp. 2219–2227*, *figs. 4*).—Report is made of the recovery of three strains of *R. diaporica* from *D. andersoni* collected in southeastern Wyoming. The morphologic and tinctorial characteristics of the organisms, the reaction in guinea pigs, the experimental transmission by *D. andersoni*, and cross-immunity tests with the original Montana strain of *R. diaporica* indicate that the three Wyoming strains and the Montana strain are identical.

**Cultivation of various species of trypanosomes in the developing chick embryo,** B. J. Longley, N. M. Clausen, and A. L. Tatum. (Univ. Wis.). (*Soc. Expt. Biol. and Med. Proc.*, *41* (*1939*), *No. 2*, *pp. 365, 366*).—In the work reported the authors were successful in cultivating *Trypanosoma rhodesiense*, *T. equiperdum*, *T. brucei*, *T. evansi*, and *T. hippicum* in the developing chick embryo. *T. lewisi* was also cultivated but not very satisfactorily. No change in virulence of these organisms appeared during the time of cultivation. The strain of *T. rhodesiense* remained arsenic-fast throughout the period of 41 days of cultivation in the chick embryo.

**Preliminary note on the growth of Trypanosoma equiperdum in the developing chick embryo,** C. A. Mitchell, R. V. L. Walker, L. M. Heath, and D. G. McKercher (*Canad. Jour. Compar. Med.*, *3* (*1939*), *No. 8*, *pp. 223, 224*).—In experimental work conducted, young chicks infected late in embryonic life developed trypanosomiasis and died on the fifth day after hatching. Embryos which were infected earlier died in the shell, and although trypanosomes were not seen in the embryo blood, this blood proved infective and produced trypanosomiasis in rats and guinea pigs.

**Investigation of tubercle bacilli in hen's eggs** [trans. title], G. Hülphers (*Skand. Vet. Tidskr.*, *29* (*1939*), *No. 12*, *pp. 1213–1226*; *Eng. abs.*, *pp. 1223–1225*).—A brief review is first made of the literature relating to the occurrence of tubercle bacilli in hens' eggs, a list of 16 references to which is included. Of the total of 2,914 eggs investigated, tubercle bacilli have been demonstrated in 0.41 percent. An investigation was made by the author in Sweden of 155 eggs laid by a flock of 30 hens suffering from organ tuberculosis and 10 eggs laid by a second flock similarly affected with this disease. From each egg a hen was inoculated in the breast musculature with a mixture of 5 cc. of egg yolk and egg white and kept under observation for 3 mo. In none of the 12 that died before the close of the observation, nor in the 153 that were killed after the 3 mo., could any tuberculosis be discovered on section. In order to determine the effect of heat, eggs were infected with avian tubercle bacilli and boiled 2 at a time for 3, 4, 5, 6, 7, and 8 min., respectively. "The breast musculature of hens was inoculated with the white or the yolk of the eggs thus boiled. In each instance, 1 hen was inoculated with the white of the 2 eggs and 1 hen with the yolk of the same eggs. In the hens inoculated from the eggs which had been boiled for 3 min., there was found tuberculosis at the place of inoculation, and also in the liver and spleen. The hens which had been inoculated with the yolk and white of the eggs which had been boiled for 4, 5, 6, 7, and 8 min. proved, on section, to be free from tuberculosis." While the author has shown that tubercle bacilli appear to occur relatively seldom in hens' eggs, and the danger of humans contracting infection from such eggs is not very great, the importance of not underestimating such danger is stressed.

**Pulmonary tuberculosis in man as a source of infection for cattle,** F. W. Nielsen and N. Plum (*Vet. Jour.*, *96* (*1940*), *No. 1*, *pp. 6–18*).—Reference is made

to the infection of cattle with the human type of the tubercle bacillus, with a more detailed account of a case in which a tuberculous process in a mesenteric lymph gland was produced by this type. A brief description is given of the course of 17 cases in which sound cattle have been infected from persons with open pulmonary tuberculosis due to the bovine type. These 17 herds comprised altogether 632 head of cattle, of which 384 gave a positive tuberculin reaction.

**Observations on the bovine blood picture in health and under parasitism,** E. Delaune. (La. State Univ.). (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 2, pp. 482, 483*).—An investigation of the blood of 6 normal Jersey and Holstein calves between the ages of 2 days and 6 mo. reveals an average of 8.7 million red cells, 10,674 white cells per cubic millimeter of blood, and a differential leucocyte count as follows: Lymphocytes 64.4 percent, monocytes 12.2, neutrophiles 19.6, and eosinophiles 3.3 percent. Six counts made of each of 5 adult animals between the ages of 3 and 6.5 yr., which were on range and which were considered to be normal from the standpoint of the absence of disease, revealed an average of 6.39 million red cells and 10,225 white cells per cubic millimeter of blood, with a differential leucocytic count of lymphocytes 58.1 percent, monocytes 8, neutrophiles 25.9, and eosinophiles 7 percent. The feeding of a pure nodular worm culture produced in one calf a sharp drop of 2.5 million red cells 5 days after the administration of the larvae, with an increase of 5,000 in the total number of white cells caused by an increase above the previous range of 17 percent in the number of neutrophiles. These general changes were of constant occurrence, though not so sharply shown in the 6 individuals which had a mixed infection of hookworms (*Bunostomum phlebotomum*) and nodular worms (*Oesophagostomum radiatum*) as in the 2 animals with the pure nodular worm infection. The calves used in all these experiments were kept under controlled conditions preceding and during the period of infection. For each experimentally parasitized calf, a control calf was kept under similar conditions.

**The examination of milk for streptococci of mastitis as an indicator of the streptococcus infection of bovine mammary tissue,** C. S. Bryan, G. R. Moore, and J. H. Campbell. (Mich. Expt. Sta. et al.). (*Vet. Med., 35 (1940), No. 3, pp. 166–168*).—In the work reported 67 of 94 cows tested were found to have streptococci in the milk prior to slaughter, and the mastitis streptococci were present in the udder tissue collected immediately after slaughter. "In 27 of the 94 cows streptococci were not found in the milk prior to slaughter, and the streptococci were not found in the udder tissue. Six of these cows were free of streptococcic mastitis on monthly tests for periods varying from 6 to 36 mo. prior to slaughter. The absence of streptococci in properly collected milk samples was evidence that streptococcic infection was not present in the udder tissue. Two of 6 heifers that had never lactated were found to be infected with streptococci of mastitis. The remaining 4 yielded no streptococci upon examination of the mammary secretion or tissue."

**The rapid detection of mastitic milk by a portable electrometric device,** E. C. McCulloch. (Wash. Expt. Sta.). (*Vet. Med., 35 (1940), No. 3, pp. 158–164, figs. 5*).—A description is given of a device which makes possible the rapid and relatively accurate determination of the electrical conductivity of milk. This conductivity has been found to be a good indicator of milk from abnormal quarters. Early cases of mastitis can be detected with a degree of accuracy comparable to that of the more time-consuming and complicated chemical or biological tests now in use. Radio earphones are worn by the operator, who milks a stream into the machine which then is dialed to indicate the degree of electrical conductivity. The test can be made very rapidly, and since the

result is known immediately opportunity is given the veterinarian to make physical examination or to collect samples for confirmatory tests and to supervise such sanitary measures as he may deem necessary.

**The relationship of parturient hemoglobinemia of dairy cows to aphosphorosis**, D. E. Madsen and H. M. Nielsen. (Utah Expt. Sta.). (*North Amer. Vet., 21 (1940), No. 2, pp. 81–89, figs. 3*).—Report is made of studies conducted in connection with the work previously noted (E. S. R., 81, p. 574), the details being given in tables. In the feeding experiments conducted, one of five cows receiving rations presumably low in phosphorus developed hemoglobinemia. Erythrocyte counts and the pulse rate suggested some disturbance in the health of the other cows. It is pointed out that rations of alfalfa and wet beet pulp which are commonly fed in Utah and Idaho areas usually do not supply the minimum phosphorus requirement. Aphosphorosis has been found to exist in nearly all herds of dairy cows where hemoglobinemia occurs. The use of dibasic sodium phosphate intravenously, combined with the administration of sodium phosphate or bonemeal in drenches, has quickly corrected the hypophosphatemia found in parturient hemoglobinemia. The conditions under which parturient hemoglobinemia occurs and the chemical examination of the blood plasma and of the feeds consumed indicate a deficiency of phosphorus in the ration as a factor contributing to its cause. A list is given of 13 references to the literature.

**Experimental transmission of bovine venereal trichomoniasis**, C. W. Rees and G. G. Garlick. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 59 (1939), No. 10, pp. 769–775*).—Report is made of the results of work conducted in which *Trichomonas foetus* was introduced into an experimental herd of cattle by intravaginal inoculation of heifers with bacteria-free and virus-free cultures of the parasite. Seven of the heifers, after an abortion or the birth of a calf, were again used for the experimental transmission of the disease. These animals were kept in ½-acre paddocks provided with adequate shelter and had access to a limited quantity of green feed and an ample quantity of hay, grain, and minerals. Subsequently a bull infected during coitus with one of the infected heifers was used for the transmission of the disease. Of the 15 cases of experimentally transmitted trichomoniasis described in heifers and cows, in 10 there had not been any previous infection and in 5 there was previous infection. In general, the cases of first infection were severe and those of second infection were mild. "In 1 heifer transmission of *T. foetus* during pregnancy resulted in no ill effects. Another infected heifer did not show indication of oestrum. In 7 cases infection of the females resulted in failure of early conception and in irregularity or temporary absence of oestrum. The infection was finally overcome and conception and normal gestation followed. In 1 heifer conception was followed by pyometra. One cow that had a vaginal infection as a heifer showed slight resistance to reinfection. In 4 cows, reinfection followed reexposure by coitus with an infected bull but without evident ill effects. By intravaginal inoculation the incubation period was as short as 2 days. By coitus the incubation period averaged about 11 days. The data do not indicate that the method of transmission had any influence on the course of the disease. Examinations of material from the vaginas of infected females revealed *T. foetus* in 58 percent of the tests. Trichomoniasis has persisted for 20 mo. in a bull infected during coitus with an infected heifer. Transmission of *T. foetus* occurred in every female served by an infected bull. Infection of a bull with *T. foetus* has had no apparent effect on the animal's potency."

**Trichomoniasis in the Utah Experiment Station dairy herd**, D. E. Madsen and R. Jensen. (Utah Expt. Sta.). (*Vet. Med., 35 (1940), No. 3, pp. 170–175, fig. 1*).—Three observations made in the station dairy herd by the authors indi-

*cate that in the female the uterus is the primary site of infection of Trichomonas foetus:* (1) After exposure to infection, animal No. 1 (H 300) became positive to examination for 11 days, then negative for 30 days, and then returned to positive for 31 days without further exposure. All examinations were made from vaginal contents. (2) In every case of infection an occasional negative diagnosis was made during the period when most diagnoses were positive. (3) Examination of the genital tract of two animals showed that the mucopurulent exudate was being discharged from the uterus. These data indicate that trichomonads are found in the vagina, in some cases, only as they are discharged from the uterus. In one heifer, however, trichomonads were demonstrated in the vagina 6 mo. prior to birth of a normal calf. It appears that two courses of infection were manifested in this herd. The one course was characterized by the discharge of purulent exudate and trichomonads from the uterus for approximately 18 days, after which discharges ceased, the uterus returned to normal, parasites were no longer demonstrable, and normal breeding cycles were resumed. The other course, illustrated by the first animal, was characterized by uterine discharges for about 11 days with positive findings, after which discharges ceased for 30 days, during which period examinations were negative for trichomonads. This was followed by another period of 31 days, during which there was purulent discharge from the uterus and parasite examinations were positive. It is likely that the third animal (H 329) and the second (H 323) had a disease course similar to that of the first.

"Experience with 9 definitely diagnosed cases of this disease during 1936 and 1937 showed that 3 animals recovered and calved. Three animals were not bred following their detection and were sold for slaughter, and the remaining 3 animals were bred but proved to be sterile, presumably as a result of their uterine infection. The experience in 1938 and 1939 showed a higher incidence of recovery. Seven of 9 infected animals recovered and gave birth to normal calves or are now in advanced pregnancy. Two of these received treatment; the others did not. During the entire period of study, 1936 to 1939, a total of 18 cases of infection in females and 2 cases in bulls were found. Ten of the females made complete recoveries. This suggests that to a certain extent trichomoniasis of the cow is a self-limiting disease. It seems likely that some cows will require corpus luteum enucleation before recovery can be effected. An antiseptic uterine douche in the 1 case tried appeared to have a good effect on recovery. Inasmuch as no new infections have developed as the result of service [since the bulls were] last treated, it seems possible that such treatment was efficacious. The culture method of diagnosis used was found to be more satisfactory than the earlier method of direct microscopic examination. During the 8 yr. of observations, 506.5 mo. of production were lost in temporarily and permanently sterile heifers The cows during the same period lost 293.5 mo. of production, the economic loss of which was partially overcome by extended lactation periods."

**A note on the effect of tapeworm infestation on the condition of sheep,** D. A. Shorb. (U. S. D. A.). (*Vet. Med., 35 (1940), No. 3, pp. 180, 181, fig. 1*).

**The agglutination reaction in Corynebacterium ovis infection,** H. S. Cameron and W. A. McOmie. (Univ. Calif.). (*Cornell Vet., 30 (1940), No. 1, pp. 41–46*).—A method of preparing a *C. ovis* antigen suitable for the tube agglutination reaction is described. Serums from several sources were tested for agglutinins against this organism. Old sheep, feed lot lambs, and beef cattle reacted, but to varying degrees. There was little difference between the old sheep and the beef cattle but a significant difference between these and feed lot lambs. Normal rabbits failed to react, but injected rabbits reacted at a high titer.

Three humans, two of whom had been in contact with infected sheep, failed to react. A method of preparing and using pseudotuberculin is described. When 45 old sheep were tested, eight gave a positive skin test. In four cases external lesions were apparent, but in two cases showing external lesions the intradermal reaction was negative.

**On corynebacterial infections in swine.—Preliminary report, N. Plum** (*Cornell Vet., 30 (1940), No. 1, pp. 14–20*).—A survey made of corynebacterial infections of swine in Denmark has led to the suggestion that the *Corynebacterium*, previously designated as the Holth bacillus and now assumed to be identical with *C. equi* Magnusson, may more properly be termed the *Corynebacterium* Magnusson-Holth. As this form has been demonstrated only in relatively few cases in colts, and since it can be demonstrated apparently in a multitude of swine, the designation *C. equi* does not seem very rational even though the bacterium was demonstrated first in colts and so far has been shown only to be pathogenic for these animals. It appears to be but very slightly pathogenic for swine, failing to cause their death even when injected intravenously. The diagnosis of processes found in cervical lymph glands of swine may be made microscopically with a fair degree of certainty. In these studies less than 1 percent of the cases which were diagnosed microscopically as corynebacterial infections were found by cultivation to contain tubercle bacilli.

**The incidence and classification of avian tumors, L. J. Goss** (*Cornell Vet., 30 (1940), No. 1, pp. 75–88*).—Report is made of the autopsy findings in a survey of more than 24,000 chickens from 6 different flocks. In the 7,408 birds autopsied, 8,603 disease conditions were found. "Of the birds autopsied, 1,445 (19.51 percent) contained tumors. Tumors composed of leucotic cells (both lymphocyte and myelocytelike cells) accounted for 13.38 percent of the losses. Of the total number of tumors, 23.6 percent were too decomposed to section for microscopic examination. Most of these were undoubtedly of the leucotic type. Tumors other than leucotic celled ones were seen in 113 (1.53 percent) of the birds. Thirteen different histological types of tumors were seen in 7,408 birds autopsied. Most leucotic cell tumors (76.75 percent) occur in birds under 12 mo. of age (birds of unknown age excluded). Adenocarcinomas and leiomyomas were seen for the most part (91.66 percent) in birds beyond 1 yr. of age (birds of unknown age excluded). The tumor incidence in males and females was practically equal. Diseases of the ovary and oviduct were seen in 16.97 percent of the birds autopsied. Internal parasitism was diagnosed in 20.26 percent of the autopsied birds. A chronic hepatitis of unknown etiology was observed in 78 birds."

**Some experiments upon the therapeutic treatment of fowl paralysis (lymphomatosis) of poultry and the value of iodine in relieving the symptoms of such cases, E. Gray** (*Vet. Jour., 96 (1940), No. 1, pp. 28–34, pls. 4*).

**Comparison of the tube and the whole blood tests for pullorum disease of turkeys, W. R. Hinshaw, E. E. Jones, J. F. Harr, and W. E. Niemeyer** (Univ. Calif. et al.). (*Cornell Vet., 30 (1940), No. 1, pp. 30–38*).—A comparison was made of the standard tube agglutination test (1–25 dilution) with the stained antigen whole-blood agglutination test of Schaffer, MacDonald, Hall, and Bunyea (E. S. R., 66, p. 276) applied for the detection of carriers of *Salmonella pullorum* in turkeys. The results reported are based on 7,714 tests in 13 flocks and 241 autopsies of reactors.

Of 467 reactors to the combined tests 148 were positive to both tests, 248 positive to the tube test only, and 71 positive to the whole-blood test only. Of

the 241 reactors secured for autopsy, 94 were positive to both tests, 130 positive to the tube test only, and 17 positive to the whole-blood test only. *S. pullorum* was isolated from 72 (29.9 percent) of these, all of which reacted to the tube test; 34 reacted also to the whole-blood test. A total of 666 blood samples (including some retests) were tested to determine their maximum agglutination titers; 303 were positive to both tests, 275 positive to the tube test only, and 88 positive to the whole-blood test only. "Of these, 30.9 percent of those positive to both tests had titers of 1-25, a dilution which, theoretically, should not react to the whole-blood test. In contrast, 42.9 percent of the reactors to the tube test only had titers of 1-50 or greater, titers which, theoretically, should have been detected by the whole-blood test. Titrations of the samples taken at the time of autopsy of the 72 reactors yielding *S. pullorum* showed 21 (55.2 percent) of 38 positive to the tube test alone had titers of 1-50 or greater, while 10 (29.4 percent) of the 34 which also reacted to the whole-blood test had titers of only 1-25. The efficiency of the whole-blood test, based on the results of the combined tests being equivalent to 100, was 46.9 percent and that of the tube test was 84.8 percent. Based on the tube test as 100, the whole-blood test was 55.3 percent as efficient. Based on the results obtained by the bacteriological examinations of 241 reactors, the whole-blood test was 47.2 percent as effective as the tube test to detect carriers of *S. pullorum*. By the 3 methods of determination, the whole-blood test thus proved to be approximately one-half as efficient as the tube test."

**A new and effective method of treating canary-pox,** R. D. Manwell and F. Goldstein (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 2, pp. 554, 555*).—The authors have found that in the treatment of both the ophthalmic and gasping types of canary pox, a variety of fowl pox capable of causing very severe losses among canaries or other small birds, mercurochrome is highly effective. Of 26 cases in which this treatment was employed only 3 deaths resulted and these were far advanced when the treatment was commenced. Alcoholic solutions of 1.5 and 3 percent were found most suitable for application. Usually a swab was used, although the solution may be applied between the cornea and the conjunctiva with a small blunt dropper. Two applications each day for a week are usually sufficient, although it may be found necessary to continue for 3 weeks or even longer, particularly if the case is well advanced when treatment is commenced. In cases of the gasping type of the disease, affected birds have been allowed to swallow a little mercurochrome. It is concluded that the drug comes near to being a specific.

## AGRICULTURAL ENGINEERING

**[Agricultural engineering investigations of the Arkansas Station]** (*Arkansas Sta. Bul. 386 (1940), pp. 14-16*).—Floor finishes and cost reduction in rural housing are reported upon by D. G. Carter; post preservation, by Carter and W. C. Hulburt; and water resources for rice irrigation, by Carter and K. Engler.

**[Agricultural engineering investigations of the Iowa Station]. (Partly coop. U. S. D. A.).** (*Iowa Sta. Rpt. 1939, pt. 2, pp. 18-21*).—This report notes trials of the basin method of planting corn on representative soil areas of the State, by J. B. Davidson and E. V. Collins; and work on efficiency of corn pickers, by C. K. Shedd, Davidson, and Collins; on seedbed preparation for corn, and on corn production methods and equipment, both by Davidson, Collins, and Shedd; and on hill spacing of check-planted corn, by Collins, Davidson, A. A. Bryan, and Shedd.

**[Agricultural engineering investigations of the Wisconsin Station]** (*Wisconsin Sta. Bul. 446 (1939), pp. 3–7, figs. 2*).—This report contains notes on windrowing of grain before combining, the points discussed being the practicability of windrowing, a harvesting plan, comparative costs, and improvement (illustrated by a diagram) in the chaffer designed to improve the operation of small combines on rolling land, by F. W. Duffee and R. C. Fischer. The report also notes a small irrigation system operating on ⅓ gal. of fuel per hour and an electric brooder (partially dimensioned section drawing) costing but $10 to construct, both by H. D. Bruhn and Duffee.

**Duty of water investigations** (*New Mexico Sta. Rpt. 1939, pp. 62, 63*).—These have included investigations with alfalfa and cotton.

**Sprinkler irrigation in the humid sections of Oregon,** F. E. PRICE. (Oreg. Expt. Sta.). (*C. R. E. A. News Letter [Chicago], No. 17 (1938), pp. 38–40, figs. 3*).—This paper briefly outlines the development of sprinkler irrigation in western Oregon, pointing out that this method has been practiced for more than 20 yr. but has undergone rapid expansion only within the preceding 4 yr. The success of the irrigation in improving the quality of cannery beans to such a degree that canneries made contracts only for irrigated beans, and figures showing large increases in yield and net profit, are noted, together with a station sprinkler irrigation experiment on pastures, the nature and cost of the installation, the profit from gain in butterfat production, and the resulting adoption of the practice by dairymen. An improvement introduced since 1933 consists in the use of portable galvanized pipe made in 20-ft. sections with special rubber gaskets and quick couplers instead of permanent laterals and rubber hose. The portable lines can be moved in from 30 to 45 min. The 5-hp. 100 gal. per minute installations usually have a 4-in. main of light-weight steel pipe with flexible couplings to which a 3-in. portable lateral is attached at 60-ft. intervals. Usually 10 revolving sprinklers covering areas 75–80 ft. in diameter are used. Even the main pipe line is easily moved if the pasture is to be rotated with other crops. In most instances, the water is pumped from streams, although there are some shallow-well and deep-well installations.

**Nebraska tractor tests, 1920–1939** (*Nebraska Sta. Bul. 325 (1940), pp. 48, fig. 1*).—This bulletin summarizes the results of 107 of the 328 tests made since 1920 and includes data on all tractors reported by their manufacturers as on the market January 1, 1940. The general procedure is that previously followed (E. S. R., 80, p. 832).

**An electrically heated automatic watering trough,** F. D. YUNG. (Univ. Nebr.). (*C. R. E. A. News Letter [Chicago], No. 17 (1938), pp. 45–47, fig. 1*).—The waterer consists of a watering trough attached to the outside of the dairy-barn wall and a tank attached just inside the same wall, equipped with a float and float valve, containing the electric water-heating unit, interconnected through the wall with the trough by two short lengths of 2-in. pipe. The electric water-heating unit consists of 60 ft. of soil-heating cable having a power requirement of approximately 400 w. The soil-heating cable is coiled in the bottom of one end of the inside tank. As the warm water rises from the heating unit it flows through the nearest interconnecting pipe into the outside trough, returning through the other pipe to the inside tank. A central baffle in the tank helps direct the flow of water. The water temperature in the inside tank is controlled by a bulb and bellows-type thermostat adjusted to close the heating circuit at 70° F. and to open it at 76.5°.

From January 19 to March 24, 1937, a total of 12,561 gal. of water were used by from 18 to 22 milk cows. The electric energy consumption was approximately 0.05 kw.-hr. per gallon of water heated or 0.5 kw.-hr. per cow per day.

**General purpose farm refrigerator,** P. T. MONTFORT. (Tex. A. and M. Col.). (*C. R. E. A. News Letter [Chicago], No. 17 (1938), pp. 43–45, figs. 2*).—A side-section drawing, photograph, and bill of materials show, in part, the construction of a refrigerator of 30 cu. ft. net storage capacity, all materials being those usually available at local lumber and hardware dealers. For simplicity and ease of construction, walls, floor, top, and front sections are built in separate units, then assembled with heavy lag screws. Insulation consists of 5 in. of sheet cork laid with asphalt and sealed with a layer of tarred building paper on either side. The outside finish of the walls, top, and bottom are of tongue-and-groove flooring. The inside sheathing is ⅜-in. moisture-proof plywood. The door is finished with ⅜-in. plyboard on the inner side and ⅝-in. plyboard on the front. A ¼-hp. compressor was found to supply refrigeration ample to maintain a box temperature of 36° F. under normal conditions.

## AGRICULTURAL ECONOMICS

**[Papers on agricultural economics]** (*Jour. Farm Econ., 21 (1939), No. 4, pp. 697–896, fig. 1*).—Papers on agricultural statistics are included as follows: A Century of Agricultural Statistics, by H. C. Taylor (pp. 697–706); A Close-Up View of the Development of Agricultural Statistics From 1900 to 1920, by N. C. Murray (pp. 707–717); Why The Government Entered the Field of Crop Reporting and Forecasting, by W. H. Ebling (pp. 718–734); Development of Agricultural Statistics in the Bureau of the Census, by M. R. Benedict (pp. 735–760) (Univ. Calif.); Progress of Agricultural Statistics in the World, by E. S. and W. S. Woytinsky (pp. 761–787); Agricultural Price Statistics in the United States and Abroad, by F. A. Pearson and G. E. Brandow (pp. 788–798) (Cornell Univ.); Developments in Crop and Livestock Reporting Since 1920, by J. A. Becker and C. L. Harlan (pp. 799–827), Estimating Local Market Prices and Farm Labor Since 1920, by R. F. Hale (pp. 828–837), and Future Improvement in Agricultural Statistics, by C. F. Sarle (pp. 838–845) (all U. S. D. A.); Design of Sampling Experiments in the Social Sciences, by G. W. Snedecor (pp. 846–855) (Iowa Expt. Sta.); and An Experiment in the Design of Agricultural Surveys, by R. J. Jessen (pp. 856–863) (Iowa Sta. and U. S. D. A.).

Included are the following papers prepared for the thirtieth annual meeting of the American Farm Economic Association held at Philadelphia, Pa., December 27–29, 1939: Measures Needed to Achieve Conservation and Efficient Production, by W. W. Wilcox (pp. 864–870) (Iowa State Col.); Permanent Aspects of Supply and Price Adjustment in Agriculture, by J. K. Galbraith (pp. 871–880); and Suggestions for a National Program of Rural Rehabilitation and Relief, by J. G. Maddox (pp. 881–896) (U. S. D. A.).

**[Investigations in agricultural economics by the Arkansas Station, 1938–39].** (Partly coop. U. S. D. A.). (*Arkansas Sta. Bul. 386 (1940), pp. 93–103*).—Results of investigations not previously noted are reported as follows: (1) Findings, by C. O. Brannen, as to average rates on locally assessed real estate, percentage of tax delinquency, and total tax collections 1938; (2) by J. L. Charlton, as to school population and school services in open-country school districts in Washington County; (3) as to factors affecting organization, management, and income on 407 farms in central Arkansas, studied by W. T. Wilson, and on 201 timber and livestock farms in the upper Ozark region in 1937, studied by J. W. Reid and Wilson; (4) by O. J. Hall, as to changes 1929 to 1938 of acreages in farms, acreages of different crops, and tillable and woodland pasture on 103 farms in Hempstead County; (5) as to trends in land use, labor organization, and mechanization on cotton

plantations in Jefferson, Miller, and Phillips Counties, in a study by G. T. Barton and J. G. McNeely; (6) as to farm storage and marketing of rough rice and rice prices by varieties, in studies by Hall; and (7) as to sources and amounts of short-time credit used by plantation operators, owner operators, share tenants, and cash tenants in Ashley County in the southeastern cotton area of the State, in a study by E. E. Sparlin and McNeely.

**[Investigations in agricultural economics by the Delaware Station, 1938–39]** (*Delaware Sta. Bul. 220 (1939), pp. 5–11*).—A table, by M. M. Daugherty, shows by years 1913–35 the number of farm loans in the State made by different types of lending agencies; tables, by R. O. Bausman, include data on areas in different land classes in Kent County in 1936, percentage of land in each class used for different purposes and occupied by farmsteads, and the average size of business and net returns per farm in the different land classes 1935; and tables, by H. S. Gabriel, show the number of consumers and restaurants buying apples in various quantities, and the price paid per pound when purchased in different quantities by consumers in different income groups and by different classes of restaurants.

**[Investigations in agricultural economics by the Iowa Station, 1938–39]** (*Iowa Sta. Rpt. 1939, pt. 2, pp. 78–82, fig. 1*).—Included are (1) data, by F. Robotka and R. C. Bentley, as to number of cooperative farmers' elevators in the State in 1937, numbers of members and patrons, capital and member financing, and volume of business, etc.; and (2) findings, by T. W. Schultz, on the response of acreages of corn and wheat to changes in the ratio of corn price to wheat price of the preceding year in two types of farming areas in Kansas.

**[Investigations in agricultural economics by the New Mexico Station, 1938–39]** (*New Mexico Sta. Rpt. 1939, pp. 12–14*).—Included are tables showing average costs, receipts, and net returns for slaughter and stocker and feeder cattle sold in New Mexico 1938–39; numbers of active cotton gins and gins operated by cooperative gin associations, and bales of cotton ginned by each by counties during the 1938–39 season; the percentages of rural and urban population in the United States and New Mexico by census periods from 1880 to 1930; and the average net weight of beef produced per animal unit and per section on 29 ranches in the southeastern part of the State in 1938 by type of range used.

**[Investigations in agricultural economics by the Ohio Station]** (Ohio *Sta. Bimo. Buls. 201 (1939), pp. 153–156, 164; 202 (1940), pp. 22–27*).—An article in No. 201 by C. W. Hauck entitled Reliability of Retail Prices as Guides to the Qualities of Potatoes shows the indexes of acceptability (quality) and prices paid for 100 samples of potatoes purchased in 100 retail stores in Columbus, Ohio. The coefficient of correlation between quantity and price was −0.261.

An article in No. 202 by Hauck entitled Reliability of Retail Prices as Guides to the Quality of Canned Fruits and Vegetables includes tables showing the quality scores and retail prices of 318 samples of snap beans, cherries, corn, peas, sauerkraut, and tomatoes purchased in 54 typical retail grocery stores in Columbus, and the range and average qualities and retail prices and the relationships of quality and retail prices of the 6 canned products. The coefficients of correlation found were beans 0.536, peas 0.526, corn 0.241, cherries −0.096, sauerkraut −0.347, and tomatoes −0.010.

The tables of index numbers of production, price, and income by J. I. Falconer are brought down through September 1939 in No. 201 and through October in No. 202.

**[Investigations in agricultural economics by the Wisconsin Station, 1938–39].** (Partly coop. U. S. D. A.). (*Wisconsin Sta. Bul. 446 (1939), pp.*

*73–86, figs. 4*).—Brief general findings in studies are reported as follows: (1) Chart, by D. Anderson and P. E. McNall, showing the trends from 1895 in mortgage indebtedness on 12 farms heavily in debt and 17 with practically no indebtedness; (2) changes in production plans and reason therefor in Barron County, found by R. P. Christensen, Anderson, and D. R. Mitchell; (3) differences in the spread of prices of hogs in the Madison, Milwaukee, and Chicago markets, by M. A. Schaars; (4) chart, by W. H. Ebling, Anderson, and F. J. Graham, showing average percentages of pig litters farrowed by months 1934–38, and of pigs saved per litter 1930–38; (5) data as to number, size, capacity, etc., of cold storage locker plants in the State and the use made of such lockers, obtained in the survey by Schaars; (6) data summarized from annual reports of dairy plants, by Ebling and W. D. Bormuth (Wisconsin Crop Reporting Service), as to tests in 1937 of milk going to factories making different types of cheese; (7) suggestions as to how cooperative dairy plants may be better organized and operated, based on a study by R. K. Froker; (8) discussion of the possibilities, advantages, and limitations of treating fluid milk as a public utility, based on a study by W. P. Mortenson, C. Heisig, and G. Johnson; (9) provisions, found by H. H. Bakken and M. Beal, in canning pea contracts and their effects on net returns to farmers; (10) findings, by Ebling and F. W. Beck as to percentages of Wisconsin-produced field seeds used in the producing area.

**The farm outlook for 1940** (*U. S. Dept. Agr., Misc. Pub. 379 (1939), pp. IV+46, figs. 13*).—This publication, prepared by representatives of the State agricultural colleges, Bureau of Agricultural Economics, and Agricultural Marketing Service, with the assistance of the Agricultural Adjustment Administration, Office of Foreign Agricultural Relations, Bureau of Home Economics, and Extension Service, gives information for the assistance of farmers in making their plans for 1940. The general outlook for the demand for farm products, farm credit, production costs, and farm family living are discussed. A more detailed analysis is made as to different cash and feed crops and livestock and livestock products.

**Michigan farm business summary, 1938,** H. A. Berg, C. O. May, and J. C. Doneth (*Michigan Sta. Quart. Bul., 22 (1940), No. 3, pp. 175–186, figs. 4*).—Farm account records for 1938 for 1,252 farms are summarized in tables showing by type-of-farming areas the average investments, cash receipts and expenses, net changes in inventory, net cash farm and labor incomes, percentages of land in different crops, yields per acre of different crops, numbers of different kinds of livestock and income from each, and costs of labor, machinery, and improvements. Another table compares the financial returns by years 1929–38, inclusive. The farm receipts, expenses, labor income, etc., in 1938 are discussed.

**Trends in the Minnesota dairy industry,** E. F. Koller and O. B. Jesness (*Minnesota Sta. Bul. 346 (1940), pp. 40, figs. 20*).—The changes and trends in the dairy industry in Minnesota and the factors involved are analyzed and discussed. Tables, maps, and charts show data as to the volume of milk produced; number of cows; production per cow; disposal of milk produced; trends in butter, cheese, evaporated and condensed milk, and ice cream production; number and size of creameries and cheese factories; marketing and net prices received for creamery butter; prices paid for butterfat; cost of manufacturing cheese; marketing of cheese; evaporated, condensed, and dry milk products; the ice cream industry, etc. Data are also included as to the Twin City milk market and the marketing of cream in eastern markets.

The number of milk cows increased from 101,000 in 1867 to 1,705,000 on January 1, 1939. Average production of milk per acre on farms increased from 12.8 gal. in 1899 to 22.9 gal. in 1934, and the total production from 5,925,000,000 lb. in 1920 to 8,175,000,000 lb. in 1938. Over 75 percent of the milk is used in

manufacturing dairy products. About 96 percent of the milk so used was made into creamery butter during the last decade. Of the 856 creameries in 1938, all but 27 were local creameries and 628 were cooperative. Cooperative creameries manufactured about 62 percent of the total butter output in the period 1915–19 and 72 percent in 1938. Approximately 75 percent of the creamery butter is shipped out of the State. Cheese production increased from 8,069,033 lb. in 1932 to 15,379,777 lb. in 1938. Output of condensed, evaporated, and dry milk increased rapidly during recent years. The trend of prices paid farmers for butterfat was upward from 1906 to 1920. A sharp decline occurred in 1920 and 1921 and again in 1929 to 1932. Sales of market milk by the Twin Cities Milk Producers' Association totaled 78,000,000 lb. in 1920 and 184,000,000 lb. in 1938. Shipment of 40 percent cream to eastern markets increased prior to 1929 but the depression and restrictions applied by the markets have since reduced this outlet very greatly.

**Range sheep production in northeastern Nevada,** C. E. Fleming, C. A. Brennen, G. H. Smith, Jr., and M. R. Bruce (*Nevada Sta. Bul. 151 (1940), pp. 27, figs. 4*).—Data on from 11 to 20 range sheep outfits with from 56,281 to 95,400 sheep for the years 1933–38, inclusive, were obtained. The conditions governing range sheep production in the area are described. Land ownership, death losses, lamb production, wool production, etc., in different years are discussed. An analysis is made of the average costs, receipts, and earning power per sheep unit for each year and comparison made with production and earning power for the period 1910–38, inclusive.

The earning power balance per sheep unit (receipts less costs) during the years 1933-38 were —40 ct., —$1.19, 54 ct., $1.20, 97 ct., and 32 ct., average 24 ct. The average earning power balance for the period 1910–38, based on 1933–38 production and 1910–38 prices and costs, was 78 ct. per sheep unit, or more than three times that for the period 1933–38.

**Some economic factors associated with land class in Overton County, Tennessee.—A preliminary report,** C. E. Allred, H. J. Bonser, and F. M. Fitzgerald (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 100 (1940), pp. [1]+IV+57, figs. 14*).—The development, population, topography, transportation facilities, soils, industry, and agriculture of the area are described. The relation of land classes to occupational and tenure status of families, size and value of farms, tax assessments and delinquencies, real estate transfers, and mortgage finance are analyzed and discussed. The use of census data in land class analysis is discussed and an analysis made for the county of the land class factors using the census data for 1930 and 1935.

**The farm real estate situation, 1936–37, 1937–38, and 1938–39,** M. M. Regan (*U. S. Dept. Agr. Cir. 548 (1939), pp. 42, figs. 9*).—This is a continuation of the series previously noted (E. S. R., 76, p. 408). The changes in farm real estate values in the United States as a whole and the different States and geographic divisions are analyzed and discussed and comparisons made with previous years or periods. The farm income during the period and changes of farm real estate values associated with changes in income are discussed, and also the ratio of cash rent to value of farm real estate. The trends of farm mortgage indebtedness, farm real estate taxes, and changes of farm ownership through voluntary transfers, foreclosures, tax sales, etc., are analyzed and discussed.

The index numbers of estimated value per acre for the United States were 85 in 1937 and 1938 and 84 in 1939, as compared with 79 and 82, respectively, in 1935 and 1936. "Interest rates remained low throughout the period and loan requirements for emergency refinancing receded considerably in importance.

Foreclosure rates continued to decline sharply, and for the first time since 1929 the land holdings of creditor agencies decreased slightly. The frequency of voluntary sales reached levels that were higher than at any time since data became available in 1926; the peak came during the 12 mo. ended March 15, 1937, with a slight falling off during the following 2 yr. . . .

"The increase in farm income, which was increasing at the rate of approximately $1,000,000,000 a year from 1933 to 1937, appears to have been the most influential single item supporting the increase in values during that period. In 1937, although cash income was 95 percent higher than in 1932, the percentage increase over 1936 was less than for any year since 1933, and the sharp decline in the prices of farm products to below prewar averages during the fall of 1937 was sufficient to counterbalance the effect of the increase in income (which resulted from comparatively high prices earlier in the year, together with increased marketings) insofar as farm real estate values were concerned. The lower price levels continued throughout 1938, resulting in a reduction in cash farm income of about 11 percent and affecting values adversely. The effect of the reduction in income during the past year on the financial position of farmers was offset to some extent by a reduction in the prices paid by farmers for commodities used in production. . . .

"Taxes paid by farmers were higher in 1937 than at any time since 1933. Although the lower levels of farm taxes in recent years have been a factor supporting farm real estate values, the rising tax trends have probably resulted in the lower levels not being fully capitalized." Forced sales resulting from tax delinquencies declined, and for the year ended March 15, 1938, reached a level lower than at any time since 1926.

"Credit conditions continued to be a favorable factor in the real estate situation. The volume of new mortgage credit was plentiful, while the demand for credit remained at a fairly low level, largely because of the extensive refinancing activities of the Farm Credit Administration during the period from 1933 through 1935."

**Michigan tax trends as related to agriculture,** D. C. CLINE (*Michigan Sta. Spec. Bul. 301 (1940), pp. 88, figs. 35*).—"It is the purpose of this bulletin to present a picture, largely by liberal use of charts, of the more significant trends in State and local taxation, especially as they affect the agricultural population of the State." Section 1 discusses the changes since 1900 in the total general property taxes levied, the aggregate assessed valuation of property, and the average property tax rate. Section 2 deals with other taxes collected in the State, compares their relative fiscal importance, and shows the structure of the revenue system by a series of tax "pyramids", indicating for 1913, 1930, and 1938 the composition of the State and local tax bill. Section 3 analyzes the changes in the tax situation in a group of 200 townships in distinctly agricultural sections of the State and makes comparisons with the State as a whole and with selected groups of cities. Section 4 outlines the developments in rural highway finance in the State. Section 5 shows the trends in Michigan farm taxes in relation to changes in value of farm real estate and compares such taxes with those in other States. Some of the findings are as follows:

The total general property in the State rose on an average of 24 percent per year from 1916 to 1930, declined 45 percent between 1930 and 1936, then increased 14 percent during the next 2 yr. The average rate per $1,000 assessed valuation reached a peak of $32.80 in 1932, dropped to $25.57 in 1936, and rose to $27.49 in 1938. Property taxes provided 93 percent of the total State and local tax revenue in 1913 and 56 percent in 1938. The total State and local tax bill increased 481 percent from 1913 to 1930 and then decreased 10 percent from 1930

to 1938. State payments to local governments were 178 percent larger in 1938 than 1930. In 1938 they provided the local units with more than half as much revenue as was obtained from property taxes. Ninety-five percent of the payments to local units were for education, highways, and welfare purposes. In the 200 agricultural townships the total taxes levied on general property in 1938 were 67 percent less than in 1930 and 26 percent less than in 1913. The average per capita property tax in townships was $12.87 in 1913 and $10.80 in 1938, as compared with $16.48 and $34.46 for the entire State in the respective years. The decrease from 1930 to 1938 in taxes levied varied from 45 percent to 85 percent in individual townships. Forty-eight percent was due to reductions in levies for highway purposes, 23 percent to elimination of the State levy on general property, and 18 percent to lowering of school levies. County taxes constituted 50 percent of the total taxes levied in 1938 in the townships.

The assessed valuation of the group of townships decreased 21 percent from 1930 to 1938, as compared with a decrease of 28 percent for the entire State. Assessed value of personal property dropped 43 percent and that of real estate 20 percent in the townships, as compared with 21 percent and 30 percent, respectively, for the State. The average tax rate per $1,000 assessed valuation in the group of townships was $26.10 in 1930 and $10.88 in 1938, as compared with $31.53 and $27.49 for the State. Township, county, and State property taxes for highway purposes in 1938 constituted only 2 percent of combined revenues from such taxes and highway-user taxes, as compared with 97 percent in 1913. In the 200 townships studied, taxes for roads were 96 percent less in 1938 than in 1930. In 1930 Michigan was the third highest among the States in average amount of farm real estate taxes per $100 of value, with a rate equal to 2.09 percent of the full value (United States average 1.3 percent). In 1937 Michigan was fortieth with a rate equal to 0.85 percent, as compared with 1.15 percent for the United States.

**Foreign Agriculture, [December 1939, February 1940]** (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr., 3 (1939), No. 12, pp. 543–601, fig. 1; 4 (1940), No. 2, pp. 63–130, figs. 12*).—No. 12 includes articles on British Food Control, by H. L. Franklin (pp. 545–578); Agriculture in the Venezuelan Trade Agreement, by J. L. Apodaca (pp. 579–586); and Agriculture in Haiti, by A. Lee (pp. 587–592); and notes on recent developments in foreign agricultural policy as follows: Wartime agricultural policy of Canada, New Zealand aims at self-sufficiency in wheat, Uruguay imposes tax on wartime profits, Mexican war emergency control of exports, and South Africa regulates fruit marketing. No. 2 includes Norwegian Agriculture, by C. Thomson (pp. 65–94); Chosen's Agriculture and Its Problems, by W. Ladejinsky (pp. 95–122); and British Price Policy and Price Developments in Wartime, by H. L. Franklin (pp. 123–130).

**Could hogs be sold by carcass weight and grade in the United States?** G. Shepherd, F. J. Beard, and A. Erikson (*Iowa Sta. Res. Bul. 270 (1940), pp. 445–506, figs. 16*).—The physical and economic problems of selling hogs by carcass weight and grade are described and discussed. The findings in studies by the station on cut-out value of individual hogs are included. Prices by weights, effect of the distance hogs are trucked on prices and yields, the accuracy of buyers' prices, the accuracy of estimates of yield, the relation of prices paid and actual cut-out values, why the live weight basis of selling is inaccurate, and the effect of inaccuracy are discussed. "Detailed statistical investigation indicates that commercial butcher hogs are bought on too nearly a 'flat price' basis; the differences between the values of different lots of butcher hogs are greater than the differences between the prices paid for them. Within each weight class the variations in value may be as much as five times as great as the variations in prices paid. The correlation between values and prices, lot

by lot within each weight class, is rather low. It ranged from +0.34 to +0.56 in the cases studied."

The authors arrive at the following conclusions: "As far as can be determined, packers would pay out about the same amount of money for a given year's supply of hogs under the carcass system of sale as they would under the present live weight system. If the carcass system were adopted, the benefits to hog producers would come not from any increase in the total amount of money for a given run of hogs but from three other sources: (1) The money paid for the hogs would be distributed more equitably among the different hog producers than at present. Each producer would get more nearly what his particular hogs were worth. The producer of high-yielding and high-grade hogs would get more than under the present live weight system, and the producer of low-yielding and low-grade hogs would get less. (2) Under the stimulus of this incentive for raising high-yielding and high-grade hogs, with the passage of time hog producers would bring in hogs of higher average grade and yield than under the present system. A year's run of these higher grade hogs would be worth more to packers, and would enable them to pay more money to hog producers. (3) The carcass basis of sale would remove any incentive for 'filling' hogs, and hog producers would save the cost of the feed now wasted on this practice. Shifting the basis of sale from the live hog to the carcass and putting the carcass grading in government hands would involve the minimum disturbance of existing livestock trade practices. It would simply mean moving the scales inside the plant and putting a government grader beside them. This would (1) protect farmers and others dealing with more experienced hog buyers, (2) remove the need for 'higgling and bargaining' over the yield and grade of the carcass, and (3) provide a uniform language for price quotations. By thus providing a clear, uniform, and accurate language for buyers and sellers, it would raise the plane of competition for hogs."

**Marketing commercial lettuce**, R. L. SPANGLER (*U. S. Dept. Agr., Tech. Bul. 712 (1940), pp. 82, figs. 24*).—This bulletin supersedes Department Bulletin 1412, Marketing Lettuce (E. S. R., 55, p. 483). Data are included as to types and varieties, acreage, yield, and production. The important producing areas and city markets are described. It describes and discusses harvesting, grading, sizing, and packing; Federal-State inspection; loading and shipping; financing the crop; methods of sale in producing regions; marketing information available; carlot, boat, and motor truck shipments; monthly movements; distribution of shipments; foreign trade; methods of city market distribution; prices in producing districts and city markets; etc.

**Farmers' cooperative associations in Florida.—IV, The Florida citrus exchange system**, H. G. HAMILTON and M. A. BROOKER (*Florida Sta. Bul. 339 (1939), pp. 80, figs. 15*).—This is the fourth bulletin of a series (E. S. R., 73, p. 865) dealing with farmers' cooperative associations in the State. The Florida Citrus Exchange system was founded in 1909 when 86 local associations, 9 subexchanges, and the Florida Citrus Exchange were chartered under the Non-Capital Stock Cooperative Act of 1909. During the 1936–37 season the Exchange was made up of 48 local associations and 17 general corporations grouped into 9 subexchanges and 2 associate subexchanges. The chief activity of the Exchange is handling the sales of the local associations, and that of the local organizations in preparing the fruit for market. There are two auxiliary corporations—The Exchange Supply Company and the Growers' Loan and Guaranty Company—owned and controlled by the local organizations. The citrus industry and firms handling the citrus crop are briefly described.

The organization, operation, volume of business, financing, income, expenditures, etc., of the system are described and discussed. Special attention is given

to the local associations, the sales department of the Exchange, and the two auxiliary corporations. Comparative balance sheets for the years 1910, 1920, 1930, and 1937 for one of the original local associations, average balance sheets of the cooperative associations at the end of the 1936–37 season classified by members' equity, a comparative balance sheet for the Exchange as of September 10, 1910, 1920, 1930, and 1937, a comparative profit and loss statement of the Exchange for the 1909–10, 1919–20, 1929–30, and 1936–37 seasons, a comparative balance sheet of the Exchange Supply Company for 1921, 1930, 1936, and 1937, a comparative balance sheet of the Growers' Loan and Guaranty Company for 1920, 1930, 1936, and 1937, and a comparative profit and loss statement for the same company for 1919–20, 1929–30, 1935–36, and 1936–37 are included.

Apendixes include the charter, articles of incorporation, and bylaws of the Florida Citrus Exchange, and forms of sales bulletins issued by it.

**Report of the Associate Administrator of the Agricultural Adjustment Administration, in charge of the Division of Marketing and Marketing Agreements, and the President of the Federal Surplus Commodities Corporation, 1939,** M. Perkins (*U. S. Dept. Agr., Agr. Adjust. Admin., Div. Market. and Market. Agreements and Fed. Surplus Commod. Corp., Rpts., 1939, pp. 67*).—This report to the Secretary of Agriculture describes and discusses the programs and activities of the Division of Marketing and Marketing Agreements and the Federal Surplus Commodities Corporation during the fiscal year ended June 30, 1939. The former develops the marketing agreement program and most of the surplus removal programs of the Department. The latter carries out the surplus removal programs, particularly those designed to encourage domestic distribution and consumption, and certain types of foreign programs.

**Digest of decisions of the Secretary of Agriculture under the Perishable Agricultural Commodities Act,** W. L. Evans (*U. S. Dept. Agr., Agr. Market. Serv., 1939, rev., pp. [5]+701*).—This is a revision of the digest previously noted (E. S. R., 78, p. 557). It includes the decisions of the Secretary of Agriculture under the Perishable Agricultural Commodities Act (7 U. S. C. and Supp. IV, Sec. 499 a–r).

**Crops and Markets, [January 1940]** (*U. S. Dept. Agr., Crops and Markets, 17 (1940), No. 1, pp. 24, figs. 3*).—Reports are included on cattle and sheep and lambs on feed and of grain stocks on farms January 1, 1940, employment on farms, farm labor supply and demand, farm wages, and prices received by farmers, and market reports on cotton, dairy and poultry products, feeds, seeds, grains, and livestock and livestock products. An article on cash farm income in 1939 includes tables showing the cash farm incomes 1936, 1937, 1938, and 1939 by crops, different kinds of livestock and livestock products, and from Government payments, and total income by States from crops, livestock and livestock products, and Government payments.

## RURAL SOCIOLOGY

**The sociology of rural life,** T. L. Smith (*New York and London: Harper & Bros., [1940], pp. XX+595, [pls. 9], figs. [102]*).—"This . . . is an attempt to assemble in a single volume the essential facts and the basic principles that have been derived from the application of the scientific method in the study of rural social relationships . . . in a manner that can be understood by college students of sophomore standing."

In part 1 the author outlines the features of science in general, presents the essentials of the scientific method, states the nature of sociology, and explains the relationship of rural sociology to the more general science of society. In part 2 the rural population is analyzed. The number, origin, distribution, importance,

composition, physical and psychological characteristics and health, fertility, mortality, and migration of the rural people are indicated. In part 3, rural social organization, the form of settlement, land division, land tenure, size of holdings, social differentiation and stratification, marriage and the family, rural education, religion, and political institutions and government are discussed. Part 4, social processes in rural society, deals with the competition and conflict, cooperation, accommodation, assimilation, acculturation, and social mobility. In conclusion the author discusses the factors in human behavior, cultural change in rural areas, and the future of the agricultural classes.

**Social theory and social action,** C. C. TAYLOR. (U. S. D. A.). (*Rural Sociol., 5 (1940), No. 1, pp. 17–31*).—The issue implicit in this topic is that of successfully developing the science of sociology by doing practical research. The real issue is finding and using the technics of research that sociology can bring to bear on the further discovery of knowledge which will contribute to the science of sociology on the one hand and to intelligent social action on the other. With agricultural action programs opening the gates of opportunity to the sociologist by furnishing real laboratories and elaborate funds for study, and by asking questions to which their administrators need practical answers, the sociologist has a rare opportunity to be of service to both the public and to his science. Sociology as a science will probably grow only to the extent that it makes itself useful to programs of social action.

**Socio-agricultural legislation in the Latin-American countries,** M. P. TRONCOSO (*Rural Sociol., 5 (1940), No. 1, pp. 5–16*).—This study, translated from Spanish by N. L. Whetten, indicates the nature of the progress realized by the different Latin-American nations in favor of the wage earners among the agricultural population. Positive legislation concerning the protection of agricultural laborers includes labor contracts, protection of wages, child labor, reparation for accidents, the right of unionization, health insurance, and housing of rural workers.

**[Sociological studies in Arkansas]** (*Arkansas Sta. Bul. 386 (1940), pp. 70–72, 103–105*).—Topics discussed were sickness and medical care in a rural bituminous-coal mining population, by I. C. Wilson; and population trends and adjustments, trends in town population, and migration of rural people to urban centers, by W. H. Metzler.

**[Sociological studies in Wisconsin].** (Partly coop. U. S. D. A. et al.). (*Wisconsin Sta. Bul. 446 (1939), pp. 69–73, fig. 1*).—This is a brief presentation of a study of the characteristics of "reliefers" in comparison with self-supporting families in rural areas of northern Wisconsin and the human carrying capacity of Wisconsin farms.

**Social and economic status in a Louisiana hills community,** E. A. SCHULER. (La. State Univ.). (*Rural Sociol., 5 (1940), No. 1, pp. 69–83*).—It was found that the highest social status in this community was held most frequently by nonagriculturists who own farm land but also by farm owners whose properties are relatively large and by one professional person. The lowest social status, on the other hand, was held most often by nonowning farmers but also by one farm owner, one nonagricultural laborer, and one Work Projects Administration client. Among farmers, ownership is associated on the average with higher social status than nonownership, and there is a tendency for large holdings to be positively correlated with higher social status. But since social status held by ancestors apparently tends to persist, especially in agricultural communities, the relationship between present social status and present economic status is by no means complete. The importance of the status, both social and economic, held by ancestors in the community is suggested by the facts that the highest status farmers have been owners all their lives and that,

with one exception, they have lived their entire lives in the present community. However, social status of person or family is constantly undergoing modification.

**Social-economic submergence in a Plains State,** J. M. GILLETTE (*Rural Sociol., 5 (1940), No. 1, pp. 59–68*).—This represents the results of a rural research project in North Dakota. The object of the investigation was to discover if a permanent submerged socioeconomic class of employable unemployed farmers was being formed in the towns, especially county seats, of the various counties. Practically all the information gathered in the localities affirmed the formation of such a class. Facts from the national situation and from international conditions seem to support the conclusion.

**An analysis of the changes in social organization of the American agricultural village from 1900 to 1930, 1932,** T. L. SMITH (*Minn. Univ., Sum. Ph. D. Theses, 1 (1939), pp. 331–338*).—The data concerning the social organization of 12 agricultural villages and hamlets in their trade areas are presented. The villages dealt with in this study seemed to be gaining in strength and importance. There was little, if any, evidence that the larger villages were smothering out the smaller ones. There was definite evidence of a growth in the complexity of the social organization or structure of these villages and hamlets during the 30-yr. period. The types of enterprise which are increasingly important are most closely related to the improvements in transportation and communication and the increased material standards of living. Changing methods and types of agriculture and the ability to purchase shopping goods in larger centers, resulting from increased speed and efficiency of transportation facilities, account for most of the decreases. Fundamental changes were said to have occurred in the entire system of rural organization, which greatly affected standards of living. The village and hamlet are taking on increasing importance as focal points for the activities of the rural communities.

**The impact of industrial, labor, and agricultural control policies upon farm labor (a statement of the problem),** W. T. HAM. (U. S. D. A.). (*Rural Sociol., 5 (1940), No. 1, pp. 46–58*).—"Industrial control policies, especially those relating to prices and volume of production, have a bearing upon . . . ability to find employment, whether on the farm or in industry, and upon rural wage rates. Labor control policies relating to wage rates and 'working rules,' whether enforced by a trade union or by the Government on behalf of labor, affect purchasing power and the demand for farm products, the volume of industrial job opportunities open to labor from the farm, and the competition for jobs on the farm."

**Out-of-school rural youth enter farming,** C. S. ANDERSON (*Pennsylvania Sta. Bul. 385 (1940), pp. [2]+26, fig. 1*).—In a previous study (E. S. R., 81, p. 297) an analysis was made of the high school and post-high school records of 185 rural boys who dropped out of high school before graduation. The present study deals with 54 of these boys who were found to be farming. Fifty of the number were reached for personal interviews. Notations from the interviews and from school and vocational interest records are included for 25 of the number. The characteristics of the group—intelligence, educational levels attained, acceleration or retardation in school, marital state, occupational preferences, size and nature of farms operated, previous kinds of employment, reasons for quitting school, and interest in further education—are analyzed and discussed.

The mean intelligence score of the 54 boys who were farming was 88 as compared with 88.9 for all the boys who quit school and 91.5 for all who entered high school. The average school grade of the 54 boys who were farming was 9.55 yr. as compared with 8.5 yr. for their fathers and 7.72 yr. for their mothers. Only about one-third were in the normal age grade on entering high school,

and approximately 6 out of 10 were retarded. More than 60 percent were married, and about one-third were living independent of their parents. At the time of entering high school 10 yr. before only 34 percent expressed a preference for farming. The median acreage of the farms operated by boys was 121.4 acres as compared with 108 acres for their fathers. In the period between quitting school and the study the 54 boys had held 60 jobs other than farming. Eighty-four percent of the group signified a definite interest in attending a series of agricultural evening classes.

**On the identification of the farmer,** P. H. JOHNSTONE. (U. S. D. A.). (*Rural Sociol., 5 (1940), No. 1, pp. 32–45*).—"The small free-holding class a century or so ago tended generally to identify themselves with the under dog element of society. Since then, however, the complex of social forces that have served to accelerate the commercialization of agriculture and the urbanization of country life and the educational influence of the professional leadership of agriculture have driven the more prosperous strata of farm people increasingly in the direction of identification economically with the businessman and socially with the urban and small town middle class. Thus while the lower economic strata of farm people are threatened with proletarianization, the split in rural society inherent in that movement is being widened by the movement in the opposite direction of the more prosperous group."

**Urban and rural housing** (*Genève (Geneva): League of Nations, Econ. and Financ., 1939, II A 2, pp. XXXVI+159*).—This report is the result of a study made at the request of the League of Nations in 1937. It discusses urban and rural housing in Belgium, the United Kingdom, Denmark, Finland, France, the Netherlands, Norway, and Sweden, and urban housing only in the United States and Canada.

**Rural library service** (*U. S. Dept. Agr., Farmers' Bul. 1847 (1940), pp. II+28, figs. 17*).—Superseding Farmers' Bulletin 1559 (E. S. R., 59, p. 288), this study calls attention to the many uses which rural people make of library books, including discussion groups, parent education, reading projects, rural organization programs, self-education, and reading guidance; and to regional library service and the nearly 39 million rural Americans unserved. How modern libraries are started is indicated. Other topics discussed are leadership in library development, suggestions for action, and some types of rural libraries.

## AGRICULTURAL AND HOME ECONOMICS EDUCATION

**The relations of a university to forest influences research,** J. KITTREDGE, JR. (Univ. Calif.). (*Jour. Forestry, 37 (1939), No. 12, pp. 919–921*).—The author indicates that the university may be related to forest influences research as a training ground for students who will later carry on research and as a source of contributions to research either by advanced students or by faculty members or research specialists.

**[Committee reports on rural sociological extension]** (*U. S. Dept. Agr., Bur. Agr. Econ., Farm Pop. and Rural Life Activ., 14 (1940), No. 1, pp. [2]+42*).—In this issue are presented the reports of two committees, the one appointed by the American Country Life Association at Lexington, Ky., in 1938, on the field and objectives of rural sociology extension, and the other prepared by a Committee on Extension of the Rural Sociological Society of America.

## FOODS—HUMAN NUTRITION

**[Food studies by the Arkansas Station]** (*Arkansas Sta. Bul. 386 (1940), pp. 68–70*).—Progress reports are given by H. Reynolds on a continuation of

studies on the vitamin C content of canned tomato juice as affected by the presence of iron and tin (E. S. R., 80, p. 846) and by Reynolds and J. E. Valle on the chemical composition of different varieties of Arkansas-grown grapes.

**[Studies in foods and nutrition by the New Mexico Station]** (*New Mexico Sta. Rpt. 1939, pp. 45, 46, 50*).—Progress reports are given on the proximate composition of piñon nuts (*Pinus edulis*) and of pecans grown under irrigation and the refractive index of the oils obtained from them (pp. 45, 46), and on a continuation of studies on the flavin and vitamin $B_6$ content of New Mexico pinto beans and the effect of cooking on these factors (E. S. R., 81, p. 861).

**[Research in foods and nutrition by the Wisconsin Station]** (*Wisconsin Sta. Bul. 446 (1939), pp. 40–43, 44, 46–48, 49, 52–57, fig. 1*).—Progress reports (some of which represent an extension of earlier work (E. S. R., 81, p. 141)) are given of studies by J. M. McKibbin, H. A. Waisman, O. Mickelsen, and C. A. Elvehjem on the nicotinic acid content of various foods (pp. 40, 41); by A. E. Axelrod and Elvehjem on how nicotinic acid enters into cozymase to prevent pellagra (p. 41); by Mickelsen, Waisman, and Elvehjem on the vitamin content of animal organs (p. 42); by A. Arnold and Elvehjem on the effect of fat in the diet in reducing the need for vitamin $B_1$ (p. 42); by R. W. Engel and P. H. Phillips on the protection of the liver by thyroid during vitamin $B_1$ treatment (p. 43); by J. J. Oleson, D. M. Hegsted, Elvehjem, Phillips, and E. B. Hart on the complex nature of vitamin $B_1$ (p. 43); by H. A. Schneider, B. R. Platz, and H. Steenbock on vitamin $B_6$ (p. 44); by L. E. Clifcorn, W. B. Griem and Hart on a method of stabilizing the iodine in iodized salt (pp.46, 47; by E. Van Donk, I. Fuhr, and Steenbock on the value of copper in the utilization of iron (p. 47) ;by D. V. Frost, Elvehjem, and Hart on the importance in hemoglobin building of other factors than iron (pp. 47, 48); by C. H. Krieger, L. E. Carpenter, R. Bunkfeldt, and Steenbock on the availability of phosphorus in phytic acid as affected by the calcium content of the diet (p. 49); by Schneider, P. M. Glindeman, and Steenbock on the mechanism of the production of kidney stones on a low-phosphorus diet (p. 49); by M. S. Reynolds, E. Peterson, and C. Groshong on the replacement value of the proteins of canned peas for those of eggs (pp. 52, 53); by H. T. Parsons and J. Wayne on the causes of discoloration in kitchenette sauerkraut and by Parsons and E. Machover on the extent of destruction of vitamin C in this type of sauerkraut on cooking (p. 53); By Parsons, A. L. Marlatt, C. Gray, and D. Dunbar on the effect of different heat treatments on the availability or digestibility of the proteins of soybeans (p. 54); by Parsons, J. Gardner, E. Sontag, Gray, and Groshong on the relation of raw egg white toxicity to certain proteins, with the development of a standard method of testing for this type of toxicity and by Parsons in cooperation with Elvehjem and D. W. Woolley on the relation of raw egg white injury in rats to chick dermatitis, and with P. H. Phillips on histological changes in the tissues and nerve cells as a result of egg white injury (pp. 54, 55); by H. R. Bilford and W. C. Frazier on the keeping quality of quick-frozen corn after thawing and storing at different temperatures with the identification of the organisms responsible for the spoilage (p. 56); and by L. Tarkow and Frazier on the bacteriology of kitchenette sauerkraut (pp. 56, 57).

**Refrigerated food lockers in Michigan, H. L. Seaton** (*Michigan Sta. Quart. Bul., 22 (1940), No. 3, pp. 153–159, figs. 4*).—Information of interest to the consumer is given on the development of refrigerated locker plants in the United States, the lay-out of a typical plant with services rendered, and the location, sizes, and rental charges for lockers in the State. A list is appended of nine references to the literature on cold storage lockers as community and cooperative services and the preparation of food materials for frozen storage.

**Seven centuries of scientific nutrition,** C. M. McCay. (Cornell Univ.). (*Jour. Amer. Dietet. Assoc., 15 (1939), No. 8, pp. 648–658*).—This brief review presents the story of a number of scientific discoveries selected at random from the literature of the past seven centuries.

**Manual of diets,** K. Daum (*Iowa City, Iowa: William's Surg. Supply Co., [1939], pp. [1]+III+72*).—This manual presents a brief outline of diets in present use in the University hospitals, State University of Iowa. Standards for a normal diet, with a suggested menu to meet the requirements of the average man and a brief classification of foods to indicate rich sources of various dietary constituents preface the main section dealing with therapeutic diets. These diets, worked out as modifications of the normal diet, are classified according to the nature of these modifications. Thus, type diets and suggested menus are presented to meet recommendations for modified consistency, energy content, or content of individual constituents. Dietary management is indicated for certain conditions of disease (arthritis, allergy, cardiac conditions, diabetes, and celiac disease), and a number of miscellaneous procedures (pre- and postoperative, renal function, and test meals) are outlined.

**[Nutrition studies by the Arkansas Station]** (*Arkansas Sta. Bul. 386 (1940), pp. 8–14*).—Progress reports on studies, for the most part representing an extension of earlier work, are given by L. Opper on the histopathology of endocrines in avitaminoses A and $B_1$ of rats; by B. Sure on the influence of Walker carcinosarcoma on the concentration of ascorbic acid in various endocrines and organs; by Opper on experimental arteriosclerosis and its relationship to aging (E. S. R., 81, p. 311); by M. C. Kik on the nutritive value of rice and its byproducts (E. S. R., 80, p. 848; 81, p. 867); and by Sure on quantitative requirements of components of the vitamin B complex for lactation (E. S. R., 82, p. 708).

**Basal metabolism of Indiana University women,** J. S. McCord (*Jour. Amer. Dietet. Assoc., 15 (1939), No. 6, pp. 440–450*).—The basal metabolism rates of 75 healthy subjects between 17 and 33 yr. of age (87 percent between 18 and 24 yr.) were determined with the use of the Sanborn basal metabolism machine. The tests, made in the fasting state after a full night of rest (including 8 hr. of sleep), were carried out after a half-hour period of rest and adjustment. The basal rate averaged 9 percent below the DuBois predictions, 8.3 percent below those of Harris-Benedict, and 9.6 percent below the prediction standards of Aub and DuBois. Compared with other college groups, these Indiana residents exhibited rates lower than northerners and higher than southerners. The average rates of different age groups were fairly constant, but all were low as predicted from standard tables. Certain changes in the metabolism rate were associated with the menstrual cycle, the nervous strain of examination week, and the fatigue imposed by extra activities.

**Indian and Eskimo metabolisms,** G. W. Crile and D. P. Quiring (*Jour. Nutr., 18 (1939), No. 4, pp. 361–368*).—Basal metabolism data obtained with the Jones apparatus are reported for 6 male and 7 female Chippewa Indians living on a reservation near Churchill and 30 male and 33 female Eskimos living in the vicinity of Chesterfield Inlet, Canada. A number of the tests on the Eskimos were made by T. Melling.

In terms of deviation from the Mayo normal standards for white subjects, the metabolism data for the male Indians ranged from +9 to a single value of +44 percent and for the females from +5 to a single value of +64 percent. Omitting the two highest values, the average deviation was +18 percent for the males and +18.5 percent for the females. The values for the Eskimos ranged from −3 to +42 percent for the males and from 0 to +76 percent for the females. With

omission of two values of +42 percent for the males and nine values of +40 percent or over for the females, the average deviations were +14.5 and +21.12 percent for the males and females, respectively. Corresponding averages for all values were +16.4 and +29.4 percent, respectively.

Data are also reported on the pulse rates and blood pressures. Average pulse rate values were 53.3 and 65 for Indian males and females, respectively, and from 63 to 69 and 79 to 83 for the Eskimo males and females before and after the metabolism tests. The average blood pressures were 120 systolic and 80 diastolic for the male Indians and 124 systolic and 75 diastolic for the female Indians. Corresponding values for the Eskimos were 119 and 75 and 112 and 71, respectively.

**A study of the metabolism of the Maya Quiché Indian**, G. W. Crile and D. P. Quiring (*Jour. Nutr., 18 (1939), No. 4, pp. 369–374*).—This paper reports a similar investigation to that noted above, conducted in Guatemala. The subjects included 35 male Maya Quiché Indians, 30 of whom were soldiers with from 6 mo. to 1 yr. of army service at a station located at an altitude of 8,100 ft., 5 coffee plantation laborers living at an altitude of 800 ft., 1 white male and 1 white female living at the higher altitude, and 1 white male at the lower altitude. In all 164 basal metabolism estimations were made, and in addition 20 tests were run on 10 soldiers 3 hr. after the ingestion of measured amounts of chili and corresponding tests on 6 after ingesting 1–10 gm. of tortillas.

The deviations from the Mayo normal standards for the soldiers ranged from two values of −1 to one of +22, with an average of +8.2 percent and for the laborers from −6 to +12, with an average of +5.2 percent. The 2 white males gaves values of −13 and −12 percent and the white female of −6 percent. The ingestion of chili caused an average percentage increase over the subjects' own basal rates of 8.46 percent and of tortillas of 1.30 percent. Blood pressure values averaged 111 systolic and 77 diastolic for the soldiers and 104 and 73, respectively, for the laborers. The averages for the white subjects whose average age was 31.6 yr. were 126 systolic and 74 diastolic. The average pulse rates for the soldiers were 63 before and 61 after the tests and of the laborers 62 and 60, respectively.The white female had a pulse rate of 72 and the white males an average of 68. Most of the Indian subjects were found to have diffuse endemic goiter.

**The effect of carmine upon the gastrointestinal motility of children**, I. G. Macy, L. Reynolds, and H. J. Souders (*Amer. Jour. Physiol., 126 (1939), No. 1, pp. 75–81, fig. 1*).—Seven average healthy children aged 7–11 yr. were given from 0.2 to 0.3 gm. of carmine with a test meal consisting of 2 oz. of barium sulfate plus 4 oz. of milk, the effect of gastrointestinal motility being studied roentgenographically. For comparison similar study was made on the test meal alone. The total retention time of the test meal was little affected by the carmine, but the emptying time of the stomach was decreased by 31 percent on an average, the decrease varying from 21 to 51 percent in the several subjects. Although the test meal without carmine left the stomach more slowly, it tended thereafter to increase the speed of its passage until about 4 or 5 hr. after ingestion it had made the same progress as the meal with carmine. Complete records of the time of defecation during the 26 days within which the four test meals were followed roentgenographically did not show variations that could be attributed to the carmine.

**Dietary protein and the regeneration of serum albumin.—III, The potency values of egg white, beef liver, and gelatin**, A. A. Weech and E. Goettsch (*Bul. Johns Hopkins Hosp., 64 (1939), No. 6, pp. 425–433*).—In this study, a continuation of earlier work,[4] the method previously used for establishing

[4] Bul. Johns Hopkins Hosp., 63 (1938), No. 3, pp. 154–180, figs. 3; pp. 181–186.

the efficiency of food proteins in forming serum albumin was again applied. This method involves the use of dogs in which deficits in serum albumin have been produced by feeding a basal low-protein diet for a standard period of 3 weeks. The regeneration of serum albumin is measured during the ensuing week in which the basal diet and the protein being tested are fed in proportion sufficient to furnish 80 calories and 2.5 gm. of protein per kilogram of body weight. The assay value of a food is calculated as 0.15 (an allowance for maintenance) plus the rise in albumin concentration (in grams per 100 cc. of serum). The potency value of a food is determined by averaging a number of assay values from experiments with different dogs. The data indicate the following potency values for albumin formation: Egg white $0.616\pm0.023$, beef liver $0.445\pm0.025$, gelatin $-0.093\pm0.041$, beef serum $0.801\pm0.053$, beef muscle $0.475\pm0.021$, and casein $0.338\pm0.027$. Values for the last three proteins were obtained in the earlier study. Statistical analysis of the results for these six foods indicates that beef serum and egg white are clearly more potent than the other four foods, that the difference between beef serum and egg white is barely significant, that gelatin is definitely inferior, and that there is no significant difference between beef muscle, beef liver, and casein.

**Salt taste threshold of humans,** C. P. Richter and A. MacLean (*Amer. Jour. Physiol., 126 (1939), No. 1, pp. 1–6*).—By a "choice" method the subject sampled the salt solution in comparison with distilled water until he felt satisfied with regard to the taste of each. The concentration at which 53 subjects recognized the difference in taste between salt and water averaged 0.016 percent, the median being 0.010 percent. The average concentration at which they first definitely recognized the taste of salt was 0.087 percent, with a median of 0.065 percent.

**Calcium citrate uroliths on a low phosphorus diet,** H. Schneider and H. Steenbock. (Wis. Expt. Sta.). (*Jour. Urol., 43 (1940), No. 2, pp. 339–344, fig. 1*).—During a previously noted investigation (E. S. R., 81, p. 884) of a low-phosphorus rachitic diet for rats, the formation of urinary calculi was observed. Because of the relation of this finding to earlier observations of McCarrison (E. S. R., 66, p. 392) of calculus formation in rats on diets with a low ratio of phosphorus to calcium, the calculi were subjected to further study.

The calculi, which were hard white concretions varying in size from a pin point to 7 mm. in diameter, were found to be composed primarily of calcium citrate, with only a trace of phosphorus. The method of Pucher, Sherman, and Vickery (E. S. R., 75, p. 745) was used in determining the citrate content, which, expressed as citric acid, amounted to 66.4 percent of the calculi. Analyses of a number of human calculi gave values ranging from 0 to 1.5 percent. "These low values would suggest that if citrate is of importance in the genesis of human stone its role may be limited to the formation of the primary nidus upon which phosphates and other salts ultimately are precipitated." The possible pathological significance of the appearance of calcium citrate in the urinary tract is discussed, but with no definite conclusion as to the conditions under which it may be formed from the citric acid, which is normally excreted in amounts varying from 0.2 to 1 gm. daily.

**"Trace" elements in human and animal nutrition,** W. Godden (*Chem. and Indus., 58 (1939), No. 34, pp. 791–796*).—This review, given as an address, devotes attention to manganese, cobalt, nickel, zinc, aluminum, strontium, barium, beryllium, fluorine, bromine, iodine, and selenium, presenting briefly evidence concerning their respective roles and some information on their occurrence in foods.

**Planning the day's diet for vitamin content**, H. E. MUNSELL. (U. S. D. A.). (*Jour. Amer. Dietet. Assoc., 15 (1939), No. 8, pp. 639–647*).—Vitamins A, C, and D, and nicotinic acid and vitamins $B_1$ and G of the B complex are considered briefly as to their nature and origin and the amount needed to meet human requirements. Practical suggestions for meeting these requirements are stated in terms of actual foods.

**The vitamin A and vitamin D content of some Australian fish liver oils**, M. M. CUNNINGHAM and E. C. SLATER (*Austral. Jour. Expt. Biol. and Med. Sci., 17 (1939), No. 4, pp. 457–464, fig. 1*).—A study was made of the seasonal variation of the oil content of the liver of the snapper shark (*Galeorhinus australis*) and of the vitamin A content of the oil. The percentage of oil was figured on the basis of the petroleum ether extract, but the vitamin A values, determined by the Carr-Price method, were determined on oils extracted by petroleum ether, by steaming, or by a combination of these procedures. The percentage of vitamin A in the oil was found to be high from the beginning of March to the middle of October, the highest values (up to 1.46 percent) being obtained in the winter months (May to August). The percentage of oil in the liver was largely the reverse of this, the livers being more oily in the warm than in the cold season. As a net result the amount of vitamin A in a definite weight of liver was roughly constant throughout the year.

The vitamin A content of the liver oil and the yolk from some embryo snapper sharks was also determined, very low values (0.007 percent for the oil, minute traces for the yolk) being obtained. These results support the observations of previous workers that breeding is not a strain on the vitamin A reserves of the parent fish. Vitamin D, determined by the method of Hume, Pickersgill, and Gaffikin (E. S. R., 68, p. 152) was found to be very low in the livers of the gummy shark (*Mustelus antarticus*) and the snapper shark, the average being but 1 and 2 International Units, respectively. The liver oils of four species of tuna and of the skate were found to contain from 0.02 to 0.45 percent of vitamin A.

**Carotene content of different varieties of green and mature soybeans and cowpeas**, W. C. SHERMAN and W. D. SALMON. (Ala. Expt. Sta.). (*Food Res., 4 (1939), No. 4, pp. 371–380*).—The carotene content was determined by a method similar in principle to the Peterson, Hughes, and Freeman modification[6] of the Guilbert method for determining carotene in forage. With the mature seeds the extraction of the carotenoid pigments was greatly facilitated by the use of skellysolve B instead of alkaline methanol.

Values are reported for 45 varieties of soybeans and 9 varieties of cowpeas in the fresh green stage (moisture content 68–70 percent) and samples from one or both of the crops of two seasons for 41 varieties of mature soybeans and 8 of cowpeas (moisture content 6–9 percent). In the green stage most of the varieties of soybeans proved to be very good sources of carotene, although the variety range was wide—from 212γ per 100 gm. for Higan to 705γ for Tanloxi. There was no apparent relationship between size and carotene content, but a close correlation between intensity of green coloration and carotene content. The fresh cowpeas had a very much lower and more uniform content of carotene, ranging from 140γ per 100 gm. for Dixie Queen to 231γ per 100 gm. for Lady pea and Virginia blackeye. Considerable destruction of carotene took place during the maturing process with all varieties of both soybeans and cowpeas. Although the results for the same varieties during the two seasons were not in absolute agreement, they fell within the same general range. The length of time the seed pods were allowed to stay in the field had a marked effect on

[6] Indus. and Engin. Chem., Analyt. Ed., 9 (1937), No. 2, pp. 71, 72.

carotene content, the losses on excess ripening amounting in some instances to over 50 percent in 2 weeks. Minimum and maximum values reported for seeds tested at early maturity were 17.5γ and 243.5γ for soybeans and 20.8γ and 41.7γ per 100 gm. for cowpeas.

**The effect of treated fats on vitamin A potency,** R. T. Harrelson, P. M. Nelson, B. Lowe, H. C. Dyme, and V. E. Nelson. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 13 (1939), No. 4, pp. 353–364*).—This paper reports the details of an extensive series of studies, noted in annual reports of the station (E. S. R., 81, p. 140), undertaken to determine by rat feeding tests the extent of destruction of vitamin A in butterfat by other fats heated and unheated and of vitamin A in butterfat or egg yolk in cooky mixtures baked with various oils and fats. The results of the investigation are summarized as follows:

"Most of the heated fats that were studied caused destruction of vitamin A in butterfat. Some heated oleomargarines and some heated coconut oils destroyed vitamin A, whereas others did not. The data seem to indicate that peroxides in heated fat are not the only factors concerned in the destruction of vitamin A. Heating fat at or below 80° C. did not develop the characteristic change in the fat which causes inactivation of vitamin A. Rancid fats appear to cause destruction of vitamin A. The effects of the addition of fats to baked products on the vitamin A of the products will depend on the nature of the substances used as a source of vitamin A in the baked products, possibly upon the nature of the fats added, and upon certain unknown factors involved in the baking process."

**An experiment in human dietary night-blindness,** G. Wald, H. Jeghers, and J. Arminio (*Amer. Jour. Physiol., 123 (1938), No. 3, pp. 732–746, figs. 5*).—This paper describes a series of dark adaptation tests, with a specially designed adaptometer, conducted on a single adult male subject. The data reported show that all aspects of vision in dim light, including color vision, are impaired in vitamin A deficiency, and that the primary change in dietary hemeralopia is not retardation in the velocity of dark adaptation, with little or no change in its final level but rather the extent of adaptation, as shown by the cone and rod plateaus and eventually the threshold at all levels of visual adaptation. The threshold of the completely dark-adapted eye not only responds first to the deficient diet, but regularly exhibits by far the greatest change. When hemeralopia has been established, a single massive dose of vitamin A or carotene produces, after a latent period of about 30 min., a temporary lowering of the threshold to normal, the speed being twice as rapid after carotene as after vitamin A administration. The latent period is reduced to about 7 min. if the carotene is injected intramuscularly instead of given by mouth. The greater rapidity of the effect with carotene is thought to be due to the greater efficiency of its absorption and transport rather than of its utilization.

The authors conclude that the most appropriate visual measure of vitamin A deficiency is the threshold of the complete dark-adapted eye. "We suggest, therefore, that in future clinical procedures for estimating dietary night blindness, preliminary light adaptation be omitted. Subjects may be dark-adapted in a darkened room or by some other device for withholding light from the eyes. Following 30 to 45 min. in darkness, the visual threshold may be determined repeatedly. The scatter of the measurements provides a clear indication of the reliability of the subject's reports. Their average, a single number, should constitute the most exact index now available of the hemeralopic state, and therewith of the vitamin A nutritional level."

**The vitamin $B_1$ content of foods in terms of crystalline thiamin,** L. E. Booher and E. R. Hartzler (*U. S. Dept. Agr., Tech. Bul. 707 (1939), pp. 20*).—This publication has been summarized by the authors as follows:

"This bulletin presents the results of vitamin $B_1$ assays of the edible portions of 100 food items including fruits, vegetables, cereals, meats, and dairy products. The vitamin $B_1$ values were determined by the rat-growth method using crystalline thiamin as a standard of reference. The results are given in tabulated form in terms of International Units and in terms of micrograms of thiamin per 100 gm. of the foods. Details of the method of assay, preparation of materials used in the vitamin $B_1$-deficient ration of the experimental animals, and statistical analysis of the data are included. Vitamin $B_1$ was found to be widely distributed in common foodstuffs. The most important natural food sources are whole-grained cereals, legumes, nuts, and lean pork. Fruits in general are not important sources of vitamin $B_1$. Vegetables, other than the legumes, are distributed between fair (30–100 I. U. per 100 gm.) and unimportant (less than 30 I. U. per 100 gm.) sources. The text carries a review of current literature on the vitamin $B_1$ content of foods, a review of the current methods being used for vitamin $B_1$ assays, and a classification of foods as sources of vitamin $B_1$."

**Fatty livers as a result of thiamin administration in vitamin $B_1$ deficiency of the rat and the chick,** R. W. Engel and P. H. Phillips. (Wis. Expt. Sta.). (*Jour. Nutr., 18 (1939), No. 4, pp. 329–338, figs. 4*).—Earlier observations of the development of changes in the liver indicative of fatty degeneration in rats cured of vitamin $B_1$ deficiency by administration of thiamin (E. S. R., 80, p. 810) led to a more thorough histological and chemical study conducted on growing rats and chicks during thiamin therapy in $B_1$ avitaminosis.

The earlier histological findings were confirmed in both rats and chicks, although there were no gross manifestations of toxicity. The histological reactions, described as hydropic degeneration and fatty metamorphosis in the parenchyma of the liver cells, were not prevented in rats by choline, lipocaic, or diets high in fat or casein, but were prevented by desiccated thyroid. Chemical analyses of the livers showed an increase in total fat, glycogen, and moisture but no changes in phospholipides and protein.

It is concluded that thiamin therapy in experimental vitamin $B_1$ deficiency causes an excessive production of free fat in the liver cells which disrupts the normal cell structure. It is noted, however, that recent evidence with the chick indicates that there is a gradual resorption of the liver fat over a period of 6 weeks even although thiamin is administered continuously. "The fact that the animals made remarkable weight gains and showed no gross ill effects from the thiamin therapy would indicate that even though the liver tissue appears abnormal histologically, its function has not been seriously and permanently disturbed."

**A note on the vitamin $B_1$-sparing action of fat,** D. Melnick and H. Field, Jr. (*Jour. Nutr., 17 (1939), No. 3, pp. 223–226*).—Apropos of the suggestion that the vitamin $B_1$-sparing action of fat might be due to the actual presence of thiamin in fat, lard was subjected to chemical analysis by methods calculated to liberate any bound thiamin that might be present, followed by a sensitive method (see p. 11) specific for thiamin. The results were entirely negative, indicating that lard contains no thiamin. The conclusion is considered justified, therefore, that "the vitamin $B_1$-sparing action of fat cannot be attributed to actual administration of the vitamin but to the decreased metabolic requirements for thiamin when the fat content of the diet is increased."

**Further observations on the carbohydrate, fat, and protein appetite of vitamin B deficient rats,** C. P. Richter and B. Barelare, Jr. (*Amer. Jour. Physiol., 127 (1939), No. 1, pp. 199–210, figs. 2*).—Rats previously kept on a standard diet were offered at the age of 65 days a self-selection diet in which the various components were furnished in separate containers. Previous studies (E. S.

R., 81, p. 598) have shown that on the selections made from the assortment of substances offered rats grew and reproduced normally. The present experiments were designed to study the changes in the fat, protein, and carbohydrate appetite of the rats offered the self-selection diet from which yeast was omitted and one of the *B* components (thiamin, riboflavin, nicotinic acid, or W factor) or a combination of two or four of these factors was made accessible. Animals receiving none of the B complex ingested more oil, much less sucrose, and practically no casein as compared to control rats receiving the self-selection diet containing yeast. Those on the diet minus yeast but receiving thiamin ate normal amounts of sucrose, stopped drinking olive oil, but refused to eat casein; the *group given access to riboflavin showed an increased appetite for casein; others* offered nicotinic acid had much the same appetite as the vitamin B [complex]-free controls; and animals offered the W factor showed a constant and normal *olive oil intake.* Rats *having access to thiamin and riboflavin or all four components* tended to show sucrose and olive oil appetites similar to animals on the self-selection diet with yeast, but most striking was the return to the casein appetite. On riboflavin the survival time averaged 106 days, on thiamin 95 days, and on nicotinic acid 85 days. When entirely deprived of all vitamin B, survival time averaged only 65 days.

**The effect of a nicotinic acid deficiency upon the coenzyme I content of animal tissues,** A. E. Axelrod, R. J. Madden, and C. A. Elvehjem. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, *131* (*1939*), *No. 1*, *pp. 85–93*, *fig. 1*).—The method (E. S. R., 82, p. 727) was used to determine the coenzyme I content of certain tissues in an uncomplicated nicotinic acid deficiency produced in young dogs.

In dogs extreme deficiency of nicotinic acid caused no change in the coenzyme I content of the red blood cells. Values for the brain, kidney cortex, and blood of a dog sacrificed in the last stages of deficiency did not differ significantly from the corresponding values for a dog which had received nicotinic acid for 10 days previous to the test. The liver values, however, were 70 percent and the muscle values 22 percent lower in the first than in the second dog. In general similar differences were noted in comparable studies on pigs. In a comparison of the coenzyme I content of various tissues and organs of dogs with no, mild, and severe symptoms of blacktongue, lower values were obtained for the livers of the animals with mild and severe blacktongue than for the normal animals, lower values for the muscle tissue of the animal with severe blacktongue than for the other two, and no appreciable differences among the three in the values for brain, kidney cortex, and blood. Similar tests on normal rats and rats given three injections of nicotinic acid revealed no appreciable differences.

The assumption is made that the normal level of coenzyme I in the brain, kidney cortex, and blood of animals suffering from nicotinic acid deficiency "is absolutely essential, a decrease being incompatible with life. This assumption does not hold true for the liver and muscle, which apparently can maintain their vital functions, although presumably to a greatly lessened degree, in the absence of their normal content of coenzyme I. The possibility still exists, however, that in the absence of coenzyme I the transfer of hydrogen from metabolite to oxygen is effected through the medium of other carrier systems. In this manner the normal metabolism could be maintained."

**Studies on the metabolism of pyruvic acid in normal and vitamin $B_1$-deficient states.—II, Blood pyruvate levels in the rat, pigeon, rabbit, and man; *III, The relation of blood pyruvate to cardiac changes*,** *G. D. Lu* (*Biochem. Jour.*, *33* (*1939*), *No. 5*, *pp. 774–786*, *figs. 2*).—In the first of these papers data obtained by the method described in the first paper of the series (*E. S. R., 82, p. 58*) are reported on the blood pyruvate levels of normal and

vitamin $B_1$-deficient animals and man as follows: Normal pigeons (5 cases) 0.87 mg. per 100 gm. blood, rats (5) 1.09, rabbits (11) 0.98, and man (60) 0.4–0.75, with a mean of 0.55 mg. per 100 gm. blood; vitamin $B_1$-deficient pigeons (5) 5.39, rats (4) 3.21, and man, subacute deficiency (84), 0.77–1.93, with a mean of 0.93, and acute (38) 1.00–5.77, with a mean of 2.72 mg. per 100 gm. blood. The effect of exercise on blood pyruvate levels was tested on rabbits. The average fasting level in 3 rabbits of 1.09 mg. per 100 gm. was increased to 1.60 mg. when the animals were allowed to feed and move about. The average increase in blood pyruvate of 3 rabbits following exercise for 3 min. was 3.34 mg. over the normal (not fasting) level. The injection of 180 mg. of pyruvic acid was required to bring about the same increase in the blood level as produced by the exercise.

In the second paper comparisons are reported of blood pyruvate values and pulse rates of rats in acute and chronic vitamin $B_1$ deficiency and in a combined state of vitamin $B_1$ deficiency and infection. The effects are also reported of injections of pyruvate on the heart rate in rabbits and rats. In the rats a definite relation was shown between blood pyruvate levels and pulse rate. In the acute-deficiency group the blood pyruvate increased from the normal level of about 1 mg. per 100 gm. to 4 mg. per 100 gm., while the pulse rate dropped from 550 to 300 beats per minute. In chronic deficiency the pyruvate values also varied with the pulse rate, although for a given pulse rate the levels tended to be higher than in the first group. In the third group there proved to be little correlation between pulse rate and pyruvic acid levels. The administration of vitamin $B_1$ to animals in various stages of deficiency was followed by removal of bradycardia and restoration of the blood pyruvate levels in the first group but not in the groups suffering from chronic deficiency, with or without infection. Injection of pyruvate into blood of normal rats and rabbits had no effect on the heart rate.

In discussing the application of these findings to man, it is concluded that in any given case only the combination of blood pyruvate measurements, exercise tolerance tests, and clinical symptoms can differentiate between true vitamin $B_1$ deficiency and other conditions which in some respects simulate it.

**Nature of a yellow deposit in jars of home-canned green asparagus,** H. CAMPBELL. (U. S. D. A.). (*Food Res., 4 (1939), No. 4, pp. 397–399*).—A sediment of fine needlelike crystals of a yellow color frequently observed in glass jars of home-canned green asparagus has been found to give the reactions of flavone derivatives. It is concluded that the crystalline deposit is a flavone or flavonol glucoside which probably appears as a result of extraction during the heat processing and subsequent crystallization on cooling. It is noted that the deposit has been found only rarely in commercially canned asparagus, possibly because of differences in the stage of maturity and promptness of processing under commercial conditions.

**Report of three cases of ariboflavinosis,** J. W. ODEN, L. H. ODEN, JR., and W. H. SEBRELL (*Pub. Health Rpts. [U. S.], 54 (1939), No. 19, pp. 790–792*).—The authors present clinical histories of three cases found in a rural section of Georgia. Treatment with 5 mg. daily of synthetic riboflavin cured the mouth lesions in from 3 to 7 days with the exception of a slight reddening in the healed areas.

**Riboflavin deficiency in man (ariboflavinosis),** W. H. SEBRELL and R. E. BUTLER (*Pub. Health Rpts. [U. S.], 54 (1939), No. 48, pp. 2121–2131, fig. 1*).—A group of adult white women in good general condition, living in an institution, were given a special diet low in nicotinic acid and very low in riboflavin content but adequate in every other respect. The diet was continued for 365 days, during which time 13 out of the 18 women "developed a reddened, denuded lesion

of the lips, maceration and fissuring in the angles of the mouth, and seborrheic accumulations at the nasolabial folds. These lesions disappeared following the daily administration of synthetic riboflavin; they reappeared following the discontinuance of the riboflavin, and again disappeared following riboflavin therapy. Six of these women were treated for varying lengths of time with nicotinic acid without benefit. Four of the remaining 5 women began a daily preventive dose of synthetic riboflavin on the one hundred and thirty-ninth day and showed no lesions of any kind during the 365 days of observation. One woman did not receive any riboflavin therapy and showed no lesions at any time during the 365 days of observation." It is pointed out that the lesions of the lips (cheilosis) and the seborrheic accumulations on the face are similar in appearance to the condition formerly described as pellagra sine pellagra. Considering the curative and preventive action of the riboflavin, the conclusion seems warranted, however, that these lesions are a manifestation of riboflavin deficiency.

**Does an increase in vitamins $B_1$ and $B_2$ have a protective (sparing) action on vitamin C consumption?** [trans. title] E. PRÜTER (*Pflüger's Arch. Physiol., 242 (1939), No. 4, pp. 464–467*).—In experiments conducted on guinea pigs no evidence was obtained of a sparing action of either a vitamin $B_1$ concentrate (Benerva) or flavin for vitamin C. Vitamin C saturation tests on two human subjects also showed that the administration of vitamin $B_1$, either orally or subcutaneously in doses of 2,500γ, had no sparing action on vitamin C consumption. Attention is called to the report of Kasahara et al. (E. S. R., 81, p. 875) in which a synergistic action between vitamins $B_1$ and C was noted. In the author's opinion this effect may have been due to the ascorbic acid furnished by the brewers' yeast which was used as a source of vitamin $B_1$. Determinations by the methylene blue method of the ascorbic acid content of brewers' yeast gave a value of 0.8 mg. percent, indicating that a daily feeding of 10 gm. of the yeast would furnish 80γ of absorbic acid, an amount insufficient to protect against scurvy but sufficient to prolong the onset of the disease.

**Vitamin C in vegetables.—X, Snap beans,** G. L. MACK, W. T. TAPLEY, and C. G. KING. (N. Y. State Expt. Sta. et al.). (*Food Res., 4 (1939), No. 4, pp. 309–316*).—This paper continues the series (E. S. R., 80, p. 712). Analyses of 10 varieties of snap beans grown during the same season on Ontario clay loam soil and sampled at approximately the same stage of maturity gave ascorbic acid values ranging from 0.09 mg. per gram for the Georgian variety to 0.24 mg. for Tendergreen. Samples of Refugee grown in three successive seasons contained 0.18 mg., 0.16, and from 0.18 to 0.21 mg. per gram. Red Kidney and White Pea, ordinarily harvested as seed beans, contained 0.28 and 0.22 mg. per gram at the green snap bean stage of maturity. Seven varieties harvested at the immature, mature, and overripe stages showed differences in ascorbic acid content but with no uniformity. The seeds when separated from the pods contained from 3 to 4 times as much ascorbic acid on a fresh wet basis as the pods. The net effect produced is a minimum content at the stage at which snap beans are usually harvested, with a higher content, depending upon the proportion of seed to pod, as the pods mature.

From tests of various growth factors it was concluded that soil type is not a primary factor influencing vitamin C content except as it may affect the growing conditions which regulate the synthesis of vitamin C and that fertilizer treatment has no significant effect. Date of maturity appears to have some effect, although it is recognized that this may be due to differences in growing conditions, such as temperature and relative amounts of light and moisture available.

Four varieties stored at temperatures of 1°–3°, 8°–10°, and 21°–23° C. and tested after 1, 2, 3, and 6 days lost ascorbic acid at all temperatures but more

rapidly at the higher temperatures. The destruction was greatest for Kidney Wax and least for Refugee. After 6 days at the highest temperature only 19 percent of the original content of ascorbic acid remained in Kidney Wax as compared with 42 percent for Rufugee. When cooked to the "done" stage, 62 percent of the original ascorbic acid of Refugee was recovered from the drained solids and 26 percent in the cooking water. Similar results for Kentucky Wonder were 66 and 32 percent, respectively.

**Ascorbic acid content of tomatoes as affected by home canning and subsequent storage, and of tomato juice and fresh orange juice as affected by refrigeration,** O. E. McElroy, H. E. Munsell, and M. C. Stienbarger. (U. S. D. A.). (*Jour. Home Econ., 31 (1939), No. 5, pp. 325–330*).—Tomatoes of the Bonny Best variety, grown on a plat in Arlington County, Va., were canned by home-canning procedures, both by the cold-pack and the hot-pack method, in pint glass jars with glass caps and wire clamps, a head space of ¼–½ in. being left. At the time of canning a subsample of the raw tomatoes was reserved for immediate analysis. Of the canned tomatoes, a portion of the pack was analyzed the day after canning. Samples canned by the hot-pack method were also analyzed after a 6-mo. storage period at room temperature (70°–80° F.). Half of the jars were stored on open shelves in direct light, the other half on adjoining shelves shielded from light by black photographic paper.

Ascorbic acid determined chemically by the method of Musulin and King (E. S. R., 77, p. 743) was found to average 0.17 mg. per cubic centimeter in the raw tomatoes. The results on the canned tomatoes showed that the ascorbic acid content was not affected either by the hot- or the cold-pack canning methods as applied in this study. Increasing the time of processing of cold-pack tomatoes to as much as 60 min. did not affect the ascorbic acid content. In storage, however, there was a loss of ascorbic acid, amounting to 30–50 percent of the quantity originally present in the raw tomatoes. Light appeared to have no effect under the conditions of this experiment.

Commercially canned tomato juice stored in an open container in a refrigerator at 40°–45° showed no significant loss of ascorbic acid when stored for as much as 4 days. Juice prepared from commercially canned or from raw tomatoes by straining through cheesecloth or a wire strainer showed upon similar storage significant losses of the vitamin after 2 days. Orange juice freshly reamed and strained and likewise stored showed but gradual loss of ascorbic acid, beginning about the second day. None of the four juices tested lost appreciable amounts of ascorbic acid during the first 24 hr.

**Variations in ascorbic acid content of bananas,** P. L. Harris and G. L. Poland (*Food Res., 4 (1939), No. 4, pp. 317–327, figs. 2*).—For most of the values reported in this extension of an earlier study (E. S. R., 79, p. 135), reduction with $H_2S$ before extraction was carried out, although in a few cases this step was omitted, and the final titration values were increased by 37.5 percent for dehydroascorbic acid.

Normally ripened bananas from four tropical sources had practically the same ascorbic acid content, the average values for from 25 to 58 samples of each of the different varieties ranging from 0.102 to 0.110 mg. per gram. Bananas of a single variety, Costa Rica, showed increased ascorbic acid content during ripening from 0.053 mg. at the stage of green peel and hard pulp to a maximum of 0.111 mg. per gram at the stage of yellow peel flecked with brown, followed by a marked decrease after the stage of complete ripening to a value of 0.032 mg. per gram at the stage of black peel with overripe pulp. Ripe Colombia bananas, sliced as for home use and exposed at room temperature for different periods of time, lost about 12 percent of their ascorbic acid content in 20 min., the losses increasing to rather constant values around 40–45 percent after 4

or 5 hr. Slight chilling of bananas did not affect the ascorbic acid content, but severe chilling, resulting in blackening of the peel and softening of the pulp, caused losses amounting to over 50 percent.

Cooking partially and completely ripe bananas in various ways resulted in appreciable losses of ascorbic acid roughly proportional to the time rather than the temperature of cooking. The only cooked product showing no loss was partially ripe fruit baked in the unbroken peel. The range in losses with other methods of cooking was from 8.6 percent for partially ripe fruit broiled for 9 min. at 550° F. to 54.2 percent for ripe fruit peeled and baked for 19 min. at 375°. Banana powder, prepared commercially by either the spray or drum process, contained approximately 80–90 percent less ascorbic acid than bananas of the same ripeness as those from which the powders were manufactured.

**Seasonal changes in the ascorbic acid content of juice of Florida oranges,** P. L. Harding, J. R. Winston, and D. F. Fisher. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 358–370*).—Data taken in an investigation of the changes occurring in oranges during their development on the tree showed that the early and midseason varieties have as high an ascorbic acid content as Valencias with a much longer growing season. No relation was found between ascorbic acid content of juice and quality as judged by taste. There was a gradual decrease in ascorbic acid in the Valencia orange with ripening, reaching a minimum in senescent fruits. In earlier-maturing varieties the decrease was neither so pronounced nor so consistent. A stock influence was noted in that smaller quantities of ascorbic acid were found when oranges were grown on rough lemon than when grown on sour orange, grapefruit, sweet orange, and Cleopatra mandarin. Significantly higher ascorbic acid values were found in fruits picked from outside branches than from inner shaded branches. Analyses of individual oranges showed considerable variation in each lot of 25, but the range was usually of about the same magnitude in the same sample.

**Excretion of ascorbic acid in relation to saturation and utilization, with some diagnostic implications,** M. A. Spellberg and R. W. Keeton. (Univ. Ill.). (*Arch. Int. Med., 63 (1939), No. 6, pp. 1095–1116, figs. 4*).—Observations are reported and discussed on the utilization and storage of ascorbic acid as determined by the rate of saturation, excretion, and rise in blood concentration in various clinical conditions.

The diagnostic features of scurvy are considered to be a lowered renal threshold for ascorbic acid, extreme depletion of the body stores, and an unusual delay in saturation, as shown by urinary excretion values. An increased utilization of ascorbic acid, as shown by low excretion values following test doses, was observed in diseases accompanied by an increase in oxidative processes or in cellular proliferation, as in malignant tumors, hyperthyroidism, and leukemia. No abnormalities in storage were observed in clinical asthma or in portal cirrhosis. Peptic ulcer patients on ulcer diets unsupplemented with ascorbic acid gave evidence of vitamin C subnutrition in low urinary excretion and blood plasma values and delayed response to saturation tests. Alkali medication, however, was found not to interfere with the absorption of ascorbic acid.

***Influence of bacteria on oxidation of ascorbic acid,*** W. B. Esselen, Jr. (Mass. Expt. Sta.). (*Food Res., 4 (1939), No. 4, pp. 329–334*).—To determine whether or not bacteria may have an effect on the stability of ascorbic acid in foods, an aqueous solution of ascorbic acid was added to freshly inoculated and 24-hr. cultures in nutrient and glucose broths of 45 different strains of bacteria, representing 39 species, and the ascorbic acid content of the broths was determined at the beginning and end of 6 hours' incubation at 37° C. Comparison of the losses showed that none of the organisms destroyed ascorbic acid, and most of them significantly retarded the oxidation, particularly in the

glucose broth. Supplementary tests with three species of *Clostridium* grown in glucose broth under anaerobic conditions and *Lactobacillus acidophilus* grown in skim milk in an atmosphere of $CO_2$ indicated that all of these organisms and also skim milk itself exerted an inhibitory effect on the oxidation of ascorbic acid.

**Vitamin C and the aging eye: An experimental clinical study,** S. M. Bouton, Jr. (*Arch. Int. Med., 63 (1939), No. 5, pp. 930–945*).—Observations of clouding of the optic media associated with more or less impaired vision among a number of patients from 41 to 73 yr. of age in a State hospital led to an investigation of the status of the hospital population with respect to vitamin C, as estimated from 24-hr. urine values, fasting blood plasma levels, and the response in both to test doses of ascorbic acid. A group of 12 patients was selected for special study because of visual disturbances. All showed some degree of opacity in the vitreous and 5 beginning, moderately advanced, or mature cataracts. As judged by all of the tests, this group proved to be the most deficient in vitamin C of all of the subjects who included, in addition to patients, officers and employees of the institution and nurses from another hospital.

Treatment of the special group of 12 patients with 300–350 mg. of ascorbic acid for 4 or 8 weeks brought up the blood levels to high normal within the first week (after which the levels remained fairly constant at somewhat lower figures. In the last week of treatment 24-hr. urine values averaged 323.21 mg., but 11 days after cessation of treatment the values fell to an average of 16.3 mg. In the final examination for visual acuity, 2 of the group of 12 patients had to be excluded. Of the cataractous group, 4 showed no improvement as the result of treatment and the fifth no change in the lens, but lessening of the opacity of the vitreous with improvement in vision. The 5 patients with no cataract showed improvement of vision, with definite regression, and in some instances complete clearing of the vitreous. Subjective improvement in vision was evident at an early stage. Both subjective and objective improvement occurred almost entirely during the first 2 weeks of treatment, only occasional changes occurring later.

The author concludes that "ascorbic acid deficiency can be held at least partly responsible for impairment of vision associated with senescence of the human eye, and that the administration of ascorbic acid by mouth in adequate doses can counteract this process so far as the crystalline lens is not primarily involved. The lens, although showing a definitely subnormal ascorbic acid content with cataractous conditions, apparently cannot be favorably affected by the administration of ascorbic acid by mouth, even in excessive amounts, after senile changes have set in."

**The relation of vitamin C deficiency to nutritional anemia,** H. C. S. Aron (*Jour. Nutr., 18 (1939), No. 4, pp. 375–383, fig. 1*).—Hemoglobin determination and red blood cell counts on guinea pigs in various stages of supplementation or deprivation of vitamin C are reported, with the conclusions that young animals, 200–300 gm. body weight, rarely become anemic on a vitamin C-free diet because they succumb too early to scurvy, but that older animals, 450 gm. or more body weight, show a distinct reduction in hemoglobin content within 20 days on a diet furnishing inadequate vitamin C. The anemia, which is always of a distinctly hypochromic type, is not prevented by a supplement of iron, but can be cured by the administration of ascorbic acid in large quantities either orally or subcutaneously, provided the animals have lost not more than 25 percent of their body weight or one-third of their hemoglobin. The rise in hemoglobin on ascorbic acid medication is much more rapid than the rise in body weight, indicating that the anemia is cured long before the repair of other body tissues is accomplished.

**A further contribution to vitamin C therapy in experimental poliomyelitis**, C. W. JUNGEBLUT (*Jour. Expt. Med., 70 (1939), No. 3, pp. 315–332, pl. 1, fig. 1*).—An extension of earlier studies on the effect of ascorbic acid on poliomyelitis virus in vitro and in vivo (E. S. R., 77, p. 138) is reported, with results demonstrating that in vitro multiple paralytic doses of different strains of poliomyelitis virus can be inactivated by small amounts of ascorbic acid, and that in vivo under certain conditions the vitamin is capable of influencing favorably the course of experimental infection in monkeys, although the effect is slight and is limited by a number of factors not yet under experimental control. It is pointed out that the destructive effect in vitro is not limited to poliomyelitis virus, but has been demonstrated for a large number of animal and plant viruses and bacterial toxins. As similar antiviral and antitoxic effects have not been obtained thus far with any other vitamin, except a possible action of vitamin D on poliomyelitis virus, it is thought that vitamin C "may truthfully be designated as the antitoxic and antiviral vitamin."

The bearing of the experimental data reported on the use of ascorbic acid in the prophylaxis and therapy of human poliomyelitis is discussed, with the conclusion that "an answer is not easily provided, since the factors which permit natural infection in the susceptible child are not reflected in the animal experiment." However, reference is made to the extensive observations of Heaslip[6] on poliomyelitis in South Australia, which led to the conclusion that a low level of vitamin C nutrition predisposes to infection and severity of attack.

**Natural vitamin K and synthetic vitamin $K_1$**, S. ANSBACHER, E. FERNHOLZ, and H. B. MACPHILLAMY (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 2, pp. 655–658*).—The data presented on the results of biological assay (using a 6-hr. test period) of a number of synthetic compounds permit the conclusion that 2-methyl-3-phytyl-1,4-naphthoquinone, its diacetate derivative, synthetic vitamin $K_1$ (Merck), the isomeric isophytyl compound, and 2-methyl-3-dihydrophytyl-1,4-naphthoquinone, methylnaphthoquinone, and the diacetate of its corresponding hydroquinone show a potency of 1 unit, as noted on page 12, in 7½γ, 15γ, 15γ, 15γ, 15γ, ½γ, and 1γ, respectively. With a test period of 18 hr. the phytyl derivatives appeared to have increased potency, indicating that these derivatives are not utilized by the animal body as rapidly as the 2-methyl-1,4-naphthoquinone unit itself. The speed of action of the latter is practically identical with that of the unit of the natural vitamin K.

The vitamin K concentrates from alfalfa, showing potencies of 1 unit in about 2γ, gave a Dam-Karrer color reaction not nearly so strong as that of 2-methyl-3-phytyl-1,4-naphthoquinone. This is interpreted to mean that a vitamin K different from vitamin $K_1$ exists in alfalfa. The complexity of such concentrates was further borne out by chromatographic analysis, using calcium sulfate as the adsorbent. Fractions varying from deep red to yellow to nearly colorless were obtained, the latter being most potent.

**Hemorrhagic adrenal necrosis in rats on deficient diets**, F. S. DAFT and W. H. SEBRELL (*Pub. Health Rpts. [U. S.], 54 (1939), No. 51, pp. 2247–2250*).—Extensive hemorrhagic necrosis of the adrenal glands of rats was observed to occur under various dietary deficiencies. Neither purpura nor the bone marrow changes frequently associated with deficiencies of various factors of the B complex were observed. It is considered probable that the condition is due to a deficiency in some unidentified factor and unlikely that the condition is part of the syndrome described as panmyelophthisis.

**Hemorrhagic cortical necrosis of adrenals in rats on deficient diets**, A. A. NELSON (*Pub. Health Rpts. [U. S.], 54 (1939), No. 51, pp. 2250–2256*,

[6] Austral. Jour. Expt. Biol. and Med. Sci., 16 (1938), No. 4, pp. 287–302, fig. 1.

*pls. 2*).—Pathological material from the 30 rats observed in the above study and from 44 additional animals on a variety of diets deficient in some member of the B complex was studied for gross and microscopic lesions. The hemorrhagic cortical necrosis of the adrenals and other lesions found are described. Panmyelophthisis was found in only 1 rat of this series, and this animal had no adrenal lesions.

**The blood picture in hemorrhagic anemia,** J. M. Leichsenring, A. Biester, et al. (*Minnesota Sta. Tech. Bul. 139 (1939), pp. [1]+120*).—This is the detailed report of a comprehensive investigation of the blood changes occurring in hemorrhagic anemia produced by bleeding in dogs maintained on a synthetic diet. Four groups of healthy adult dogs, totaling 19, were used in the investigation proper, and 31 others to make a total of 50 for the establishment of normal values for the various chemical and physical blood measurements for comparison with corresponding measurements following bleeding. In the first group of 4 males approximately 20 percent of the total blood volume was withdrawn twice for 3 of the dogs and 4 times for the fourth, with recovery periods of 4 weeks, during the first 2 of which 100 gm. of beef liver daily replaced part of the synthetic ration. In the second group of 5 females and 4 males approximately 25 percent of the blood was withdrawn at each of 2 bleedings 2 or 3 days apart, and the progress of recovery was followed over a long period, usually 12 weeks. The third group of 3 males was maintained on the synthetic ration for about 6 mo. and then subjected to 4 or 5 bleedings. The fourth group, also of 3 males, was subjected to 3 or 4 bleedings and observed for 3–3½ mo. Only a portion of the accumulated data on the last 2 groups is included in this report.

The various bleedings were planned to simulate in size and number hemorrhages that may occur in human subjects following accidents, childbirth, excessive menstrual losses, etc. It is noted that the blood withdrawn from each dog for purposes of analysis amounted to from 65 to 70 cc. daily or approximately 5 percent of the total blood volume, but that these losses are comparable to losses often experienced by human subjects before or after severe hemorrhage.

Values found to return to normal relatively rapidly after bleeding were plasma volume, total calcium and phosphorus in the circulating plasma, serum albumin, and fibrinogen; those that returned to normal slowly or remained persistently below normal were individual red cell volume and diameter, total blood volume, total cell volume, cell volume percentage, hemoglobin, serum globulin, and protein nitrogen of the whole blood; and those for which no marked trends were observed were leucocytes, nonprotein nitrogen, urea, creatinine, and amino acid nitrogen. In discussing these findings attention is called to the similarity between the characteristics of the hemorrhagic anemia observed in the present investigation on dogs and those which have been reported by other observers as charasteristic of hypochromic microcytic anemia in humans. On the basis of the order of return to normal of various constituents in the present study, the authors express the opinion that "certain measures are of infinitely greater significance than others as a means of establishing the status of a person following blood loss. Thus judgment of an individual's condition, based on the hemoglobin level, red cell count, or red cell hematocrit, in the very early stages of recovery would give an erroneous conception and create a false sense of security. It is therefore evident that to secure an adequate basis for assessment it is necessary to secure total plasma volume and total cell volume data to be used in conjunction with other measures. In the later stages of recovery also, red cell counts are of limited usefulness, since an increase in count may be associated with a decrease in cell size, resulting in a total cell volume still markedly below

the normal level. For example, a high count, associated with small size, suggests repeated or long-continued blood losses; a low red cell count, with cells of normal size, is indicative of a recent severe hemmorrhage. It may be concluded, therefore, that several carefully selected combinations of blood measurements will more adequately evaluate the condition of a person after bleeding has taken place than any single criterion."

The usefulness of the publication is enhanced by the arrangement of the material in sections, with summaries for each section, as well as a general discussion and summary. The section on normal values includes tabulated data from the literature, references to which are assembled in an extensive bibliography. Tabulated data on each of the experimental animals during the entire period of study are given in an appendix.

**Production of mottled enamel halted by a change in common water supply,** H. T. DEAN and F. S. MCKAY (*Amer. Jour. Pub. Health, 29 (1939), No. 6, pp. 590–596, figs. 8*).—This address summarizes the findings in the communities of Oakley, Idaho (E. S. R., 70, p. 573), Bauxite, Ark. (E. S. R., 82, p. 571), and Andover, S. Dak. (E. S. R., 81, p. 747).

**The influence of diet on the chronic toxicity of selenium,** M. I. SMITH (*Pub. Health Rpts. [U. S.], 54 (1939), No. 31, pp. 1441–1453, pls. 2, figs. 3*).—Rats of the Wistar strain were placed at 30–35 days of age on experimental diets containing 10 p. p. m. of selenium furnished by a 50 percent level of seleniferous wheat containing 20 p. p. m. of the element. The diets, adequate as to mineral and vitamin supplements and containing casein, olive oil, or beef fat, and in some cases additional carbohydrate in the form of starch, were adjusted to represent a high carbohydrate-low protein type (75 percent carbohydrate, 10 protein, and 10 percent fat), a high fat type (41 percent fat, 43 carbohydrate, and 10 percent protein), and a high protein type (30 percent protein, 10 fat, and 55 percent carbohydrate). Control diets of the high carbohydrate and high fat types were made up with nonseleniferous wheat. Records were kept of total food and selenium (calculated) intakes, growth response and general appearance were noted, hemoglobin was determined, red blood cell counts were made, and histological studies of the organs were made at autopsy.

On the high carbohydrate-low protein diet the selenium proved very toxic, as evidenced by the development of atrophic nodular cirrhosis, ascites, pleural and pericardial effusions, blood destruction and anemia, and death. Loss of hair was also evident but not especially marked. On the high fat-low protein diet and with comparable intakes of selenium, the fat apparently exerted some protein-sparing action, since the symptoms of pronounced toxicity were not evident. There was, however, stunting of growth, extensive loss of hair, and some fatty degeneration of the polygonal cells of the liver, conditions from which the animals readily recovered upon returning to a balanced nonseleniferous diet. On the high protein diet, the selenium was only slightly, if at all, harmful. These results indicate that the effects of toxicity of naturally occurring food selenium are determined not so much by the level of intake as by the protein-selenium level. In these experiments at a level of 10 p. p. m. of selenium a ratio of 1 gm. of protein: 30 μg. or less of selenium per 100 gm. of diet had little, if any, toxic effect. Under the same conditions a ratio of 1 gm. of protein : 100 μg. of selenium per gm. of diet was dangerously toxic.

## TEXTILES AND CLOTHING

**Two rapid methods for estimating fineness and cross-sectional variability of wool,** J. I. HARDY and H. W. WOLF (*U. S. Dept. Agr. Cir. 543 (1939), pp. 16,*

*figs. 8*).—The 2 methods described for determination of the fineness and cross-sectional variability of wool are designed for application to breeding work but may be applied in other branches of the sheep and wool industry and also to other textile fibers. The count method involves the counting of the number of fibers in a given area at a magnification of 500 diameters. The average diameter and standard deviation in microns may be estimated by means of 2 curves. The comparator method involves a system of bringing standard cross sections into comparison with unknown cross sections. In one of the 2 distinct systems for obtaining this comparison, the standards are recorded on 35-mm. films and are projected beside the unknown. The count method was found to be extremely accurate and gave values very close to those obtained by direct measurements. The comparator method was also an improvement over eye judgment of wool fineness, but its superiority was in rapidity, which surpassed that of the count method.

**The adequacy of labeling certain textile fabrics with regard to fiber content,** H. FLETCHER and L. DENNHARDT. (Kans. Expt. Sta.). (*Jour. Home Econ., 32 (1940), No. 1, pp. 37–40*).—Previously noted from another source (E. S. R., 81, p. 749).

**Household textiles have small place in the farm budget, yet add much to the comfort, convenience, and attractiveness of home,** D. DICKINS (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 2, p. 8*).—This discussion of the place given to household textiles in the time and money budgets of the average Mississippi farm family is based upon earlier studies (E. S. R., 66, p. 694).

## HOME MANAGEMENT AND EQUIPMENT

**[Family economics studies by the Arkansas Station]** (*Arkansas Sta. Bul. 386 (1940), pp. 72–74*).—Progress reports (E. S. R., 80, p. 861) are given by I. C. Wilson and O. J. Hall on a continuation of the study of marketing the products of home industries; by Wilson on analysis of farm home account books kept during 1937 by home demonstration club members with a comparison of expenditures for certain budget items at different expenditure levels during 1936 and 1937; and by O. Smenner on clothing costs of different sized and different age groups within the family during 1936.

**[Consumer purchase studies of the Wisconsin Station]** (*Wisconsin Sta. Bul. 446 (1939), pp. 50–52*).—Summaries are reported of studies by M. L. Cowles and A. Thomsen on grocery buying habits in an independent grocery and a chain store of low- and medium-income families in Madison, Wis., and on the relative quantities of frozen peas and canned peas purchased by 71 families during 2 mo. in 1938 and the corresponding period in 1939.

**An international survey of recent family living studies.—I, Income and expenditure; II, Food expenditure and consumption habits** (*Internatl. Labor Off., Genève, Internatl. Labor Rev., 39 (1939), Nos. 5, pp. 662–705; 6, pp. 814–846*).—This survey of the findings assembled in some 25 countries covers the 10-yr. period 1929–39. In the first section the general scope of the inquiries in the several countries is compared, the chief data on family income are analyzed, and the differences between income and expenditure are discussed. This is followed by an analysis of expenditure subdivided into nonconsumption outgo in taxes, interest on debts, and losses and consumption outgo for food, housing, household upkeep and equipment, clothing, etc.

The second section, based on the same material as the first, is limited to food, the expenditures being analyzed to show the proportions spent on different foods. The actual quantities purchased or consumed are then analyzed according to the income of the family and where possible according to calorie value and nutritive

content in vitamins and minerals. Because of differences in consumption habits, a distinction is also made between families of wage earners or manual workers and those of nonmanual workers.

**Bacteriological tests on mechanical dishwashers for home use, W. E. Ward and G. M. Dack** (*Amer. Jour. Pub. Health, 29 (1939), No. 10, pp. 1114–1118*).—Two types of mechanical dishwashers designed for home use were subjected to controlled tests to determine their effectiveness in removing bacteria from soiled dishes. The method outlined consisted in soiling the dishes with a natural food, such as soft-boiled egg, melted Crisco, or cooked farina, that had previously been mixed with a suspension of the test bacterium, followed by washing by a standard procedure, using trisodium phosphate or an alkaline commercial preparation (Calgonite) as the detergent. Examination of the utensils was accomplished by a swabbing process. In certain tests the wash and rinse waters were subjected to examination. For comparison, results were also obtained on similarly soiled dishes washed by hand in soapy water. The food soils were inoculated with one of the following bacteria: *Staphylococcus aureus*, *Eberthella typhosa*, *Streptococcus pyogenes*, and *Mycobacterium tuberculosis*. Results showed that dishes washed in the two machines were not sterile but had fewer residual bacteria than those washed by hand. The reduction in bacteria was apparently accomplished by mechanical washing away and not by any adverse effect of temperature or germicidal action of the detergent.

## MISCELLANEOUS

**Fifty-first Annual Report [of Arkansas Station], 1939, C. O. Brannen et al.** (*Arkansas Sta. Bul. 386 (1940), pp. 110*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

**Annual report of the director [of Delaware Station], 1939, G. L. Schuster et al.** (*Delaware Sta. Bul. 220 (1939), pp. 43*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

**Report on agricultural research [of Iowa Station] for the year ending June 30, 1939, II, [R. E. Buchanan et al.]** (*Iowa Sta. Rpt. 1939, pt. 2, pp. 88, figs. 13*).—This part contains the fourth annual report of the Iowa Corn Research Institute. The experimental work recorded is for the most part noted elsewhere in this issue.

**Fiftieth Annual Report [of New Mexico Station, 1939], F. Garcia** (*New Mexico Sta. Rpt. 1939, pp. 72, figs. 10*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

**What's new in farm science: Annual report of the director, [Wisconsin Station, 1939], I, compiled by N. Clark and N. Hoveland** (*Wisconsin Sta. Bul. 446 (1939), pp. [2]+96, figs. 16*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

**Agricultural research for Mississippi farmers, C. Dorman** (*Mississippi Sta. Spec. Bul., 1939, Dec., pp. 20*).—This is a discussion of the benefits to Mississippi agriculture from the station research, citing results for the most part previously noted or referred to on page 48 of this issue.

**Mississippi Farm Research, [February 1940]** (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 2, pp. 8*).—In addition to articles noted elsewhere in this issue, this number contains Dairy Production in Rapid Increase During Past Years, by M. Guin; Spring Is Time To Poison Burrows for Crawfish Control, and Vegetable Weevils May Have Survived January Temperature, both by C. Lyle; and Fumigation Surest Preventive of Corn Damage by Insects, by J. F. O'Kelly.

# NOTES

**California University and Station.**—*School and Society* notes the recent death of Dr. Charles S. Bisson, since 1922 head of the chemical division of the College of Agriculture and station, with headquarters at Davis. Dr. Bisson was 49 years of age. A native of California, he received from the university the B. S. degree in 1915, the M. S. degree in 1916, and the Ph. D. degree in 1919. He had also served as assistant chemist from 1916 to 1919, as well as professor of chemistry in the South Dakota School of Mines from 1919 to 1922.

**Idaho University and Station.**—Hubert C. Manis has been appointed assistant entomologist in the station and assistant extension entomologist, with headquarters at the Parma Substation, vice R. W. Haegele, deceased.

**Indiana Station.**—Dr. Frederick N. Andrews, instructor in animal husbandry in the Missouri University and Station, has been appointed to have charge of investigations in reproductive physiology in animals. Dr. Ralph E. Lincoln, who has been working at Cornell University under a National Research Council fellowship on genetic variation in plant pathogenic bacteria, will have charge of investigations on breeding for resistance to disease in vegetable crops vice Vedder A. Wright, resigned June 30.

**Kansas College.**—A gift of 160 acres of high prairie land situated 4 miles from the campus has been made by Dr. C. L. Marlatt '84 and his sister, Dr. Abby L. Marlatt '88. The land is to be used as a natural area and recreation ground for the students and faculty.

**Kentucky University.**—The retirement on July 1 is announced of Dr. F. L. McVey, president of the university since 1917.

**Montana Station.**—William D. Hay, seed analyst in the grain inspection laboratory, resigned May 1 to become associate seed technologist for the United States Department of Agriculture, with headquarters at Sacramento, Calif.

**Washington Station.**—Dr. Mark T. Buchanan has been appointed assistant agricultural economist.

**Wisconsin University.**—What it is stated will be the world's first symposium on hydrobiology is to be held at the university September 4–6. It is expected that over 40 papers discussing the history, geology, physics, chemistry, bacteriology, botany, and zoology of all kinds and bodies of water in all parts of the world will be presented, including problems related to aquiculture, sanitary science, and lake and stream utilization.

Dr. L. F. Graber, professor of agronomy, has been appointed chairman of the department of agronomy.

**Entomology at Dartmouth College.**—A bequest of $5,000 has been received from the estate of the late Henry Clinton Fall, entomologist of Tyngsboro, Mass., for the promotion of the study of entomology. Additional entomological equipment is to be purchased and the collections, now numbering about 40,000 specimens, are to be enlarged. An insect survey, mainly in Vermont, New Hampshire, and Maine, is also contemplated.

**Association of Land-Grant Colleges and Universities.**—The fifty-fourth annual convention of this association is announced for the Drake Hotel, Chicago, November 11–13. Preconvention sessions will be held November 8–10.

／# EXPERIMENT STATION RECORD

Vol. 83 AUGUST 1940 No. 2

## WORK AND EXPENDITURES OF THE AGRICULTURAL EXPERIMENT STATIONS IN 1939

By Frederick V. Rand

*Senior Pathologist, Office of Experiment Stations*

In recent years there has developed on the part of the general public a greatly intensified interest in the practical results to farmers and to the country at large that are being obtained through agricultural research. The revolutionary changes in farming practices that have resulted from the new discoveries of recent years and the never-ending flow of new knowledge and new concepts of fundamental biological processes which have so greatly enhanced the well-being of all elements of the population have led the public to expect large returns from the investment of funds in agricultural science. In this expectation they have not been disappointed. The results demonstrate that investments in appropriations for agricultural research have continued to pay large dividends and have contributed vastly toward firmer foundations for a permanent agriculture and other phases of public welfare.

As attested by information contained in the recently issued Report on the Agricultural Experiment Stations for the year ended June 30, 1939, the research work by these institutions for that year has resulted in many new and deeply significant contributions to the improvement of agriculture and rural life. These contributions are recorded in more than 46,000 pages in station publications and journal articles and report progress and conclusions on some 8,500 research projects. The total funds made available to the stations for these extensive research activities, from Federal, State, and supplemental sources, amounted to $20,622,758, as compared with $19,848,068 for 1938. In addition, station research work was assisted and expanded through relations with the Federal Department of Agriculture. About 1,000 major research undertakings were conducted in cooperation with the Department bureaus under some 1,400 formal memoranda and received support from Department as well as station funds. While both agencies are interested in fundamental research as the basis of sound agricultural practices, the Department is concerned primarily with results having regional and national application and the stations with those



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of more local significance. This pooling of resources in men, money, and equipment, not only between the Department and the State stations but also among the stations themselves, has contributed immeasurably toward economies in effort and expenditure, helped to avoid useless duplication and waste, and expedited the solution of problems to the mutual advantage and profit of national agriculture.

In 1939, as in preceding years, the Office of Experiment Stations has served as a central clearing house to promote cooperation in the planning and conduct of research between the stations and the Department. During the year the Office examined and approved 344 new and 122 revised project outlines submitted for proposed Federal-grant fund expenditures. The stations had under investigation a total of 3,021 projects financed wholly or in part from such appropriations, 523, 1,680, and 818 of them falling, respectively, under the Adams, Purnell, and Bankhead-Jones funds, as compared with 505, 1,660, and 695 for these 3 funds (total 2,860) for 1938. During the year, 45 Adams, 223 Purnell, and 39 Bankhead-Jones projects were reported as completed.

The administration of the special research fund authorized by the Bankhead-Jones Act of 1935 also permitted the Office to aid in promoting cooperative relations, especially through the nine regional laboratories, each with its distinctive research program of major importance to the region which it serves. The most recent of these laboratories, established in 1939 at Cornell University, is investigating the relation of soils to plant, animal, and human nutrition, thus reflecting the widespread interest in the effects of mineral elements of the soil derived through the medium of plants used as food.

As an example of coordinated research, the national study of adjustments in farming by regions and type-of-farming areas has now been completed in 22 States, 9 having finished the study during the year. The coordinated efforts of the State stations and the Department to meet the long-time requirements of a permanently adjusted agriculture are now refocused to include agricultural adjustment, conservation, crop insurance, farm forestry, flood control, water utilization, land retirement, rehabilitation, and other factors affecting land use.

The main part of the 1939 report (241 of its 267 pages) is devoted to a summary of the progress made on specific projects and is based on the publications issued during the year by the 50 State stations, the Alaska, Hawaii, and Puerto Rico Stations, and the Federal Puerto Rico Station, supplemented by special reports of significant accomplishments submitted by the directors of these stations. The individual investigations reported upon cover a multitude of subjects relating to the most varied phases of agricultural and rural life. Obviously only a few specific examples of outstanding accomplishment can be referred to in this review.

Among the reported achievements in the agronomic and horticultural fields, productive new strains and varieties of many field, fruit, and vegetable crops, usually with superior qualities and often disease-resistant, have been brought forward by the stations, tested under field conditions, and distributed. The development and rapid adoption of hybrid corns has proved to be one of the most important changes in production technic relating to a farm crop in modern times. Effectiveness in the use of plant foods has been advanced by the perfection of foliar (leaf) diagnosis of the nutrient needs of many crop plants. Investigations on the curing of burley tobacco and on the curing and storage of sweetpotatoes and hay have brought out ways to improve these products. The types of rootstock used in citrus propagation were shown to exert a notable influence on the composition and texture of the fruits, and soil conditions a profound effect on orchard trees and their roots. The practical importance of such findings to orchard fruit culture is obvious. Another long-time investigation indicated the most important tree species for use in shelterbelt planting. Effective methods have been devised for doing away with the injurious effects to crop plants resulting from the acid soil reaction brought about by continued use of acid-forming fertilizers. A mechanical method has been developed for determining the permanent wilting point of soils, and a technic has been worked out by means of which the annual gain or loss in productivity for a field, farm, or county may be approximately determined.

Practical proof of the value of breeding crop plants for disease resistance is exemplified in the high yields of wheat and oats free from leaf and stem rusts in sections of Texas where, because of such diseases, these crops could not previously be grown on a commercial scale. Because of the concerted efforts of a number of stations there need never be a repetition of the total tobacco-seedling bed destruction sustained in the past by many growers during epidemics of downy mildew (blue mold). The use of sugar beet varieties developed for resistance to the virus-induced curly top disease has removed much of the danger formerly threatening the destruction of this industry in many of the Western States, and as a culmination of 5 years' research the once greatly feared southern root rot no longer seriously menaces sugar beet growing in central California where over 14,000 acres are known to be infested. It has been found that spraying of tomatoes may be delayed until the first appearance of leaf blight, thus eliminating the bordeaux injury to the leaves and the cost of the earlier applications. The virus-induced psorosis, or scaly bark disease, of citrus was found to be transmitted chiefly through budding from diseased trees, and leaf symptoms have been discovered which permit early detection and removal of infected trees. Other investigations have suggested that the damping-off fungi prevalent in

certain calcareous soils limit the distribution of some species of pines to such an extent that the advisability of extensive plantings of northern conifers on heavy calcareous soils is questioned.

Among insect pests of plants, the distribution of the beet webworm has been shown to depend so definitely on certain climatic factors that, except for occasional outbreaks due to climatic fluctuations, it is held extremely unlikely that this insect will become a problem outside the area thus delimited. As a result of a field study of the hibernation habits of the cowpea curculio in Georgia, it was found that comparative freedom from this pest occurs when the crop is planted so as to come into bearing about September 1. By a study of weather conditions and associated abundance of flea beetle and psyllid in potato fields, conclusions were drawn which enabled Colorado growers to prepare in 1938 to use defensive weapons in time and reduce psyllid damage by over $4,000,000. The chief blame for the nearly complete absence of sweet corn in the Southern States has been placed on the corn earworm. Practical methods for its almost complete control have now been worked out.

As examples of the results of work in the animal field, it has been shown that the loss of carotene in stored feeds is closely related to temperature, practically no loss occurring in storage near 0° C. Dried citrus pulp was found to be fully equal to dried beet pulp as a feed for milking cows, and as a result of this work about 90 percent of the grapefruit-cannery refuse of Florida is now being utilized for this purpose. Complete protection against nutritional encephalomalacia in chicks was obtained by administering a vitamin E concentrate in the feed. Early sexual maturity in turkeys proved to be hereditary, and selection made possible the production of hatching eggs earlier—a matter of importance, since a considerable portion of the early turkey egg production is sold for hatching. It was found that both oxidized flavor development and the destruction of ascorbic acid in milk were largely or entirely prevented by removing the dissolved oxygen, and a vacuum cooling process was developed for doing it. Artificial insemination studies have been so successful that cooperative artificial breeding associations have been formed by breeders in nearly 20 States.

In answer to persistent needs, the stations have strengthened their studies on the development and adaptation of mechanical equipment and on the greater efficiency in the use of farm power. Twenty or more stations have cooperated on studies of the placement of fertilizers on a wide variety of crops. Such work is now having a profound influence both on the methods of application and on the character, cost, durability, and efficiency of performance of the machinery used. To reduce the immense cost of cracking some 70 million pounds

of Persian walnuts grown annually in California, a successful internal combustion nutcracker has been developed, having a potential capacity of exploding about 900 lb. of unshelled walnuts per hour. An electric heater has been successfully adapted for curing and storing sweetpotatoes in rooms varying in capacity from 500 to 2,000 bu.

The consumer and family problems studied have included the selection of foods for quality and nutritive value and their preparation for the table. Increasing attention has been paid to human nutrition problems, the most significant recent development in such research having been the extension of studies from experimental animals to human beings. From the first, the stations have played an important part in the discovery and study of the vitamins. Meat had previously been valued chiefly for its proteins, but research of the past year or two has shown that it also furnishes significant amounts of some of the newer vitamins. With the importance now attached to providing an abundance of vitamin C in the daily diet, many contributions have reported on its available sources. In studies comparing the cooking qualities of potatoes, definite proof was obtained that the intercellular cementing material is pectic in nature and that doneness in cooking occurs when this material has been weakened. Thus changes in the nature and amount of pectic substances during maturing and storage play an important part in the cooking qualities.

Some 29 of the 50 State stations had active projects in rural sociological research during 1939. As an instance of such studies, the results of an investigation of standards of living pointed to the need of industries being dispersed throughout the poorer agricultural areas. Moreover, in the conclusions from a study of rural welfare, a more intensive use of agricultural resources and the strengthening of social organization among groups at the lower economic levels appeared to be steps whereby public agencies could effect material reductions in relief costs. Furthermore, studies in marketing, farm management, and related matters were emphasized, and additional investigations were made on taxation, tenancy, credit, land classification, types of farming, factors affecting income, costs of production, and other phases of economic and social problems having to do with the farmers of the several States.

A review such as this can do little more than suggest the general types of investigations under way and the enormous practical significance of the results attained. Although the specific examples chosen have been selected almost at random, it is believed they will serve to demonstrate that the dividends on the research investment have been large indeed, and that a perusal of the full report will well repay the time and effort of the reader.

# RECENT WORK IN AGRICULTURAL SCIENCE

## AGRICULTURAL AND BIOLOGICAL CHEMISTRY

**[Chemical investigations at the Washington Station].** (Coop. U. S. D. A.). (*Washington Sta. Bul. 384 (1939), pp. 27, 92–94*).—These have included work on apple juice, and the availability of apple thinnings as a source of pectin, by A. M. Neubert, H. H. Mottern, and J. L. St. John; the making of galacturonic acid and a table sirup from apple juice, by Mottern, Neubert, and C. W. Eddy; soft fruit products utilization, by Neubert, Eddy, and Mottern; and asparagus waste as a source material for asparagin, by Neubert, Mottern, and Eddy.

**An electrodialyzer for starch,** R. M. Hixon and V. D. Martin. (Iowa Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 11 (1939), No. 7, p. 395, fig. 1*).—An electrodialyzer for quantitative work on starch should meet the following requirements: (1) Since the concentration of starch used cannot be much greater than 1 percent, the dialyzate compartment should have a high capacity; (2) since the conductance of starch pastes is very low, the electrode area must be large to give high current capacity; (3) to avoid excessive costs of platinum, the anode must be designed to use thin foil, but graphite or base metals cannot be used for quantitative work; (4) the volume of the electrode compartments should be small for convenient recovery of the small amounts of electrolytes removed from the starch; (5) the dialyzer must be easily dismantled for cleaning and removal of the coagulated starch paste. An apparatus designed to meet these requirements is briefly described, the complete assembly and some of the parts being shown in a photograph.

**The rigidity of starch pastes,** B. Brimhall and R. M. Hixon. (Iowa Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 11 (1939), No. 7, pp. 358–361, figs. 5*).—An apparatus originally designed for the quantitative measurement of rigidity in gelatin sols has been adapted to starch pastes. The method gives reproducible results for a given set of conditions of the paste and is free from instrument constants. The application of rigidity measurements was demonstrated in the comparison of three starches showing extreme variation in physical properties and in the differentiation of nine samples of cornstarch. The assumption that rigidity is dependent upon the condition of the granule membrane is supported by the results of microscopic observation of the granules at various stages of swelling and by rigidity measurements made on several modified starches.

**Ben (Moringa) seed oil,** G. S. Jamieson. (U. S. D. A.). (*Oil & Soap, 16 (1939), No. 9, pp. 173, 174*).—The author briefly describes the tree *M. oleifera*, sometimes called horseradish tree because of the odor and flavor of its roots and freshly cut wood, from which ben seed is obtained. The oil, obtained from seed grown in Haiti, had a bright-yellow color and a slight but characteristic and pleasant flavor. Its refractive index was found to be 1.4671 at 25° C., iodine number (Hanus) 68, saponification value 186.4, and acid value 0.74, and its unsaponifiable matter constituted 1.5 percent. The oil contained 68.9 percent oleic, 8.8 of linoleic, 1.5 myristic, 3.6 palmitic, 10.8 stearic, 6.3 behenic, and 0.13 percent lignoceric acids.

**Inhibitory properties of horse-radish vapors,** M. J. FOTER and A. M. GOLICK. (Univ. Conn.). (*Food Res., 3 (1938), No. 6, pp. 609–613*).—Horseradish roots purchased on the open market were finely ground in a meat chopper, and 1-gm. portions of this material were placed in the tops of inverted Petri plates, the bottoms of which contained approximately 15 cc. of a suitable medium. The plates were sealed and incubated at 10°, 20°, and 37.5° C. for varying lengths of time. After the exposure the covers of the Petri plates were removed and replaced by sterile tops, and the plates were immediately streaked with a suspension of the test organism. The plates were then resealed and incubated at 37.5° for at least 1 week. Control incubations were made in all experiments. The organisms used were from 24- to 48-hr. slant cultures of *Serratia marcescens*, *Bacillus subtilis*, *Escherichia coli*, *Mycobacterium phlei*, and *M. tuberculosis hominis*. Heavy suspensions of these organisms were made in nutrient broth prior to streaking the exposed plates.

The vapors from the crushed roots were found to have a strong inhibitory effect, most pronounced at 37.5° and decreasing with the lowering of the temperature of exposure. The inhibitory property of the vapors from the horseradish was shown to be greater than that of garlic or onion vapors, but was more quickly exhausted than that of garlic vapors when tested under similar conditions.

**Colorimetric microdetermination of boron,** J. A. NAFTEL. (Ala. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 11 (1939), No. 7, pp. 407–409, fig. 1*).—A microgram procedure for a colorimetric microdetermination of boron involving the reaction between boric acid in the presence of oxalic acid and curcumin is outlined. It is said to be accurate for the extremely low amounts of boron generally found in soil extracts and in plants.

**Colorimetric determination of fluorine with ferron,** J. J. FAHEY (*Indus. and Engin. Chem., Analyt. Ed., 11 (1939), No. 7, pp. 362, 363*).—A suitable reagent was prepared by mixing 90 cc. of a saturated aqueous solution of ferron (7-iodo-8-hydroxyquinoline-5-sulfonic acid) with 10 cc. of 0.1 N ferric chloride solution twice normal with respect to hydrochloric acid and adding 100 cc. of distilled water. The method described was found adaptable to rocks and minerals containing as much as 10 percent of fluorine and to waters containing as little as 1 p. p. m. of fluorine. Colored salts (except chromates) which would interfere with the color comparison are eliminated by proper pH control in the treatment with zinc oxide included in the procedure prescribed. Chromates, if present in quantities causing appreciable color, must be removed. The green color of the ferron and iron solution is changed to a yellowish tint by fluorides. This is matched against standards of known fluorine content.

**A fluorometric method for determining the riboflavin content of foodstuffs,** A. Z. HODSON and L. C. NORRIS. (Cornell Univ.). (*Jour. Biol. Chem., 131 (1939), No. 2, pp. 621–630*).—The indirect method employed is designed to make allowance for the interfering effect of pigments and fluorescent substances usually present in riboflavin extracts from foods. In principle the method involves preliminary reduction with sodium hydrosulfite and stannous chloride, which destroys some of the interfering pigments and all of the interfering reducible fluorescent substances; the riboflavin, though not reduced by the stannous chloride, is reduced by the sodium hydrosulfite to a nonfluorescent form, which may be readily oxidized by air to give the fluorescent form again. The difference between readings at the nonreduced and reduced stages gives a measure of interfering stable fluorescent substances. The interference due to stable pigments is determined by adding a known amount of a standard solution of riboflavin to the unknown solution after a preliminary measurement with the fluorometer and determining the extent by which these pigments decrease the

value of the added riboflavin. By applying a correction factor the quantity of riboflavin in the unknown solution is determined.

The apparatus described consists of a fluorometer with a special filter to give a pure blue activating light, a stabilized and controlled light source, and a sensitive galvanometer for measuring the photocurrent. The fluorometer is standardized with riboflavin solutions of varying concentration, the galvanometer response being plotted against concentrations to give a standard reference graph.

Extraction of the riboflavin is accomplished with 0.25 N sulfuric acid or with an acid acetone solution. The determination involves readings on the following: (1) The extract (as the unknown solution), (2) the unknown plus a known amount of a special standard riboflavin solution before and (3) after reduction by sodium hydrosulfite and stannous chloride, and (4) the same amount of the standard riboflavin solution in a volume of water equal to that of the unknown solution. The galvanometer readings are converted to micrograms of riboflavin per cubic centimeter by reference to the standard graph, and calculations are made to correct for dilution and for the absorbing effect of the stable interfering pigments upon the activating and fluorescent light. Results on a number of foods indicate agreement of results by this method with those by the microbiological method of Snell and Strong (E. S. R., 82, p. 587).

**Determining riboflavin in dried milk products,** R. A. Sullivan and L. C. Norris. ([N. Y.] Cornell Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 11 (1939), No. 10, pp. 535–540, figs. 7*).—By the method described above, the riboflavin is extracted from the dried milk powder by refluxing with acid acetone containing 1–3 percent of hydrogen peroxide for destroying certain unstable colored impurities. The resulting solution, after neutralizing and filtering, is used for the determination, light of frequencies absorbed by riboflavin being passed through the extract and the amount of absorption being determined with a photoelectric photometer. The riboflavin is then reduced to the leuco form with sodium hyposulfite, and the measurement repeated to determine the amount of light absorbed by the impurities. From the difference between these two readings the concentration of riboflavin may be calculated to within $\pm 0.05$ μg. per cubic centimeter. Considerable detail is given as to the operation and calibration of the photometer used. This instrument, described and illustrated by diagram, utilizes a zero-potential circuit in connection with a blocking-layer photocell, thus giving a linear response to varying light intensities.

**Refractive index measurements in qualitative organic microanalysis,** P. L. Kirk and C. S. Gibson. (Univ. Calif.). (*Indus. and Engin. Chem., Analyt. Ed., 11 (1939), No. 7, p. 403*).—A hole about 5 mm. in depth was drilled approximately 1 cm. from the edge of a piece of clear plate glass about 6 mm. thick, using a steel drill 1 mm. in diameter. The bottom of the hole was polished with tripoli compound to prevent light diffraction, and on this polished bottom a scratch was made by inserting a small crystal of silicon carbide and rotating the drill slightly. The empty cell with cover slip was placed on a microscope stage, the scratch brought into sharp focus, and the fine-adjustment setting noted. The cell was filled with the liquid to be tested and the cover slip slid on and pressed down simultaneously by using an eraser on the end of a pencil. The scratch was again brought into sharp focus with the fine adjustment and the reading taken. The cell was calibrated with a series of liquids of known refractive index, plotting refractive index against fine-adjustment readings. The cell was kept completely clean and dry by using a series of fine capillaries to flush the cell with wash liquids and finally to draw through a stream of air for drying.

With the use of the polarizing microscope the two refractive indices of anisotropic crystals may readily be determined.

**Comparative accuracy and efficiency in determination of carbohydrates in plant material,** P. H. Heinze and A. E. Murneek (*Missouri Sta. Res. Bul. 314 (1940), pp. 23, figs. 5*).—An investigation of the comparative efficiency, accuracy, and reliability of five popular methods of sugar determination in plant extracts is reported upon. The sugars were secured either directly from plant tissues or as hydrolysis products of starch or "hemicellulose." A procedure, used successfully for the determination of carbohydrates in plant material by the Shaffer-Somogyi method (E. S. R., 78, p. 750), is presented in detail.

"From 15 to 50 percent and occasionally as much as 200 percent higher results were obtained with the Hagedorn-Jensen method for reducing and total sugars. These abnormally high values were caused by the presence of nonfermentable reducing substances. The Shaffer-Hartmann method gave slightly higher results than the Bertrand method. The differences were more pronounced for reducing than for total sugars. Bertrand's method was found to be the most accurate of all those studied, if it is assumed that all true sugars are determined by this procedure. The Shaffer-Somogyi method evidently is nearly as accurate as Bertrand's and is more efficient and convenient."

**Determination of uric acid in the mixed excrements of birds: A modification of the Fritz differential extraction method,** R. L. Shirley and A. H. VanLandingham. (W. Va. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 11 (1939), No. 7, pp. 381–383*).—The differential extraction method was modified to use 1-gm. samples in place of 2-gm. samples and centrifugation in place of filtration. These changes resulted in a considerable saving of time and a greater accuracy. N Hydrochloric acid and diethanolamine are recommended as the extractive reagents, since it was shown that 0.1 N hydrochloric acid and piperidine do not extract equivalent amounts of nonuric acid nitrogen from materials similar to chicken excrement free of uric acid.

**Hydrolytic treatment of cottonseed hulls,** W. H. Baldwin and J. A. LeClerc. (U. S. D. A. et al.). (*Oil & Soap, 16 (1939), No. 9, pp. 178–180*).—Alkaline solutions under the conditions of these experiments extracted from 7 to 50 percent of the lignin, depending upon the conditions of temperature and pressure. Steam under pressure had little effect upon the composition of cottonseed hulls. Dilute acids hydrolyzed more or less of the pentosans, depending upon temperature and pressure. During both the steam and acid treatments there was a slight increase in the apparent lignin content.

**Freezing by immersion: Methods and media,** J. G. Woodroof. (Ga. Expt. Sta. et al.). (*Refrig. Engin., 37 (1939), No. 6, pp. 384–387, figs. 11*).—Useful criteria of the efficiency of immersion freezing methods and of the quality of the product have been found to be the size, shape, and location of ice crystals and their relation to plant cells and to eating qualities; the amount of the "leakage" or "drip" under standardized conditions, when the product is thawed; the firmness of fruit and vegetable tissue before and after freezing as a measure of the changes in structure due to freezing and thawing; the rate of hardening of berries and other fruits during freezing as an indication of rate of freezing; and color changes during and after freezing, particularly those of red and green.

Strawberries, peaches, beans, carrots, and other products frozen by immersing in a thoroughly agitated sugar solution, cooled to 0° F., were superior to the same products frozen more slowly. By this method medium-size strawberries froze in 6 min., string beans in 2.5 min., and green peas in less than 1 min. There was a great reduction in time of freezing due to agitation, and the freezing rate of the product was increased as the speed of agitation was increased up to 7 or 8 in. per minute. For practical purposes, however, a flow of sirup of from 4 to 6 in. per second seemed most economical and desirable, both in checking supercooling and speeding up freezing. It appears that when the sugar concentration is held

at 50 percent or higher there is no danger of spoilage by molds. It seemed that sugar sirups of some sort would serve, for the time, as a medium for immersion freezing of most fruits, but vegetables are in need of further study. Any product having a cut surface is unsuitable for brine freezing because of the penetration of the freezing medium through the cut with production of a salty taste and shrinkage.

**Microbiological studies on commercial packs of frozen fruits and vegetables,** H. F. SMART. (U. S. D. A.). (*Food Res., 4 (1939), No. 3, pp. 293–298*).—A comparison of the microbial content of commercially frozen fruits and vegetables over a period of years shows that extremely high counts in these products were less common in 1935 and 1936 than previously. The types of micro-organisms most frequently isolated from commercially frozen fruits and vegetables were the common soil types which have always been considered to be without health significance but which will cause spoilage of the food provided it is not used promptly after defrosting. Defrosted, commercially packed vegetables were found to spoil much faster than similarly treated fruits when both were held at 30° C. for 24 hr.

**Further studies on behavior of microörganisms in frozen cultivated blueberries,** H. F. SMART. (U. S. D. A.). (*Food Res., 4 (1939), No. 3, pp. 287–292*).—A high microbial content of frozen blueberries may indicate inefficient washing of the raw fruit. Freezing and storage of blueberries for 9 mo. at 0° F. resulted in a reduction of the microbial content amounting to 59.7 percent, while storage at 20° for the same period resulted in 99.9+ percent reduction. The quality was preserved when they were frozen and stored at 0° for 9 mo., but the berries were not edible after storage at 20° for the same period.

Holding blueberries, immersed in sirup, for 24 hr. at 45° before freezing them resulted in a high microbial content as compared with that of those placed in freezing storage as soon as they were packed. While bacteriological examination of frozen fruit may be relied upon to give information as to the preparation and handling of fruit, it should not be the sole index in judging quality.

**Enzyme activity in frozen vegetables: Stringbeans,** C. L. BEDFORD and M. A. JOSLYN. (Univ. Calif.). (*Indus. and Engin. Chem., 31 (1939), No. 6, pp. 751–758*).—Continuing the studies on the preparation of vegetables for preservation by freezing,[1] tests were carried out on string beans of the Kentucky Wonder variety in an effort to develop scalding procedures adequate to destroy the respiratory enzymes but resulting in a minimum of undesirable changes in texture and flavor. The activity of catalase, peroxidase, and ascorbic acid oxidase and the acetaldehyde content of immature uncut and mature cut beans under various conditions were studied in relation to flavor retention during storage at −17° and −23° C., respectively.

Although decreases in catalase activity and in the resulting aldehyde content were associated with improvement in the quality of the product, they were not a reliable index of flavor retention. Ascorbic acid oxidase and catalase activity paralleled one another and were reduced at about the same rate by heating. Peroxidase, however, was definitely more resistant to heat inactivation than catalase. There was a fairly close correlation between peroxidase inactivation and keeping quality, although it was difficult to determine how much of the peroxidase need be destroyed for flavor retention. Impregnation with hydrochloric acid inactivated all three of the enzymes, while tartaric acid or sodium chloride inactivated ascorbase and decreased catalase activity but did not appreciably affect peroxidase activity. In practice neither of the acids could be employed because of the

[1] Indus. and Engin. Chem., 30 (1938), No. 9, pp. 1068–1073, figs. 2.

tissue disintegration they produced. The enzyme activity in immature cut beans was greater than in the mature cut beans. "A satisfactory product was obtained by blanching cut string beans for 2 min. at 85°–87.5°, for 5 min. at 82.2°, and for 2 min. at 100° in less mature uncut string beans."

**Survival of thermophilic food-spoilage organisms in stored white beet sugar,** H. H. Hall. (U. S. D. A.). (*Food Res., 4 (1939), No. 3, pp. 259–267*).—Thermophilic food-spoilage organisms in beet sugar stored in paper, burlap, toweling, and glass containers were found usually to undergo a decrease in numbers during storage for 8 and 20 mo. Great reductions in numbers of spores did not occur in sugar with comparable initial counts after the first 8 mo. of storage, indicating that the most rapid reduction is soon after the sugar is manufactured. The type of container did not seem to influence the survival of organisms in sugar during storage.

Comparison of the decreased spore counts with known impurities in sugar indicated no relationship. It is suggested that decreased spore counts result from dehydration caused by drying of sugar during manufacture or from the presence of hygroscopic impurities. Storage of sugar for several months after its production often results in the death of sufficient spores to raise its quality to that of canning-grade sugar. Storage seems to offer possibilities in commercial practice as a means of improving the bacteriological quality.

**Determination of the heat resistance of non-spore-forming bacteria,** E. E. Baker and L. S. McClung. (Univ. Calif.). (*Food Res., 4 (1939), No. 1, pp. 21–29, figs. 3*).—This is a study of the technic of thermal death point and thermal death rate determination. In the open-tube method, heating 4 tubes at each time interval was very unsatisfactory because of variation in end point for the same temperature. The experiments in which 8 tubes were used, while still unsatisfactory, did indicate that the thermal death time of *Escherichia coli* at 57.3° C. is between 20 and 30 min. Comparing the use of from 4 to 8 tubes at closely spaced time intervals with 25-tube groups at 4 or 5 widely spaced time intervals, the authors found the close spacing of the time intervals to be necessary for accuracy. To obtain accurate data usually 10 tubes should be heated at each time period, and the experiment should be repeated to insure that maximum heat resistance has been determined. In the work on thermal death rate it was found that the rate varies from one suspension of the same organism to another, and that variation in the quantity of the inoculum also had some effect upon the results.

**Spore-forming anaerobes causing spoilage in acid canned foods,** C. T. Townsend. (Univ. Calif.). (*Food Res., 4 (1939), No. 3, pp. 231–237, fig. 1*).—The author isolated a group of butyric acid-producing, spore-forming anaerobes having a high tolerance for acid and sugar and closely allied in their characteristics to *Clostridium pasteurianum*. They are of considerable commercial importance in the spoilage of low-acid canned fruits and tomatoes, as their spores have a comparatively high resistance to heat in acid media. Contamination seems to occur in the field and not in the cannery, and the organisms appear to be present in the soil of certain districts in large numbers. Of possible control measures, acidification is suggested as the most feasible.

**Investigations of the cracking problem in brining of sweet cherries,** E. H. Wiegand, C. E. Norton, and D. J. Pentzer. (Oreg. Expt. Sta. et al.). (*Food Res., 4 (1939), No. 1, pp. 93–100, figs. 2*).—A pH value of 1.94 was found suitable when calcium was used, but sodium or potassium required pH values higher than that suitable for calcium. The optimum pH value of calcium-sulfur dioxide solutions for Royal Anne cherries was found to be pH 1.95. Results with black cherries indicated that the variety has a bearing upon the optimum pH

value which should be employed. For Bings and Black Republicans this was determined as pH 1.83.

**Development of pink color in sauerkraut,** C. S. Pederson and C. D. Kelly. (N. Y. State Expt. Sta.). (*Food Res., 3 (1938), No. 6, pp. 583–588*).—The authors show that pink to red color in sauerkraut is due to the growth of certain yeasts, the growth of which is favored by any factor which tends to inhibit or retard the normal sequence of bacterial growth, such as raised temperature of fermentation, a higher salt or acid content than normal in the cabbage, predominance of certain types of bacteria over others, or a lack of certain nutrients. Such sauerkraut usually shows a lowered volatile acid content, a result of a disturbance of the natural sequence of growth of the bacteria involved in a normal sauerkraut fermentation. The salt content of pink sauerkraut is often above normal. Salt is usually the inhibiting factor to a natural bacterial fermentation because it is the factor which is most easily changed, but other factors may have the same effect.

"Since salting above 2.5 percent is often an essential factor in causing the development of pink kraut and since packers in general try to pack a product that will comply with regulations, it would seem advisable to change the legal definition for sauerkraut to comply with more desirable conditions of fermentation, that is, to have the upper limits for salt at 2.5 percent."

**Effect of drying and storage conditions on color and $SO_2$ retention of dried apricots,** P. F. Nichols, E. M. Mrak, and R. Bethel. (Univ. Calif.). (*Food Res., 4 (1939), No. 1, pp. 67–74*).—Apricots dried in warm and relatively dry districts were found to retain more sulfur dioxide and a better color than those dried in cool and foggy districts. Complete drying in the shade increased the drying time and reduced $SO_2$ retention by the fruit. The decrease in $SO_2$ content during storage of dried apricots varied with the storage temperature, the length of storage period, and the moisture content of the fruit. Atmospheres of air, nitrogen, or $CO_2$ or a vacuum did not prevent the decrease in $SO_2$ content or color deterioration of the fruit during storage. The color grade of dried apricots varied with the drying conditions under which the fruit was produced and the temperature at which it was stored.

**Maple sirup can be put to many uses,** C. O. Willits (*Farm Res. [New York State Sta.], 6 (1940), No. 2, pp. 1, 2, fig. 1*).—The author points out that New York State is second only to Vermont in quantity of maple products annually turned out, and calls attention also to the increasing value of maple products other than sirup. Adequate directions for production of maple cream need to be worked out; pure maple jelly is under consideration; granulated maple sugar is popular, but the method of manufacture is known to but few producers; and there is a growing demand for sugar-free flavoring concentrates and extracts. Other uses and manufactured forms of maple products are mentioned, and the manner in which commercial maple products are graded is briefly indicated.

## AGRICULTURAL METEOROLOGY

**Meteorological handbook, I, II,** edited by F. Linke (*Meteorologisches Taschenbuch. Leipzig: Akad. Verlagsgesell., 1931, vol. 1, pp. XI+316, figs. 45; 1933, vol. 2, pp. XII+336, figs. [56]*).—This is a rather comprehensive treatise consisting of signed articles on the various phases of the subject.

**Weather in the making,** D. Fisk (*London: Faber and Faber, 1939, pp. 234, [pls. 9, figs. 22]*).—A semipopular book on meteorology.

**Monthly Weather Review [November–December 1939]** (*U. S. Mo. Weather Rev., 67 (1939), Nos. 11, pp. 415–438, pls. 12, fig. 1; 12, pp. 439–480, pls. 14, figs. 4*).—In addition to the usual detailed summaries of climatological data,

solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

*No. 11.*—Mississippi River Water Temperatures at New Orleans, by A. A. Hirsch (p. 415); and Disturbance of October 29–November 8, 1939, by W. E. Hurd (pp. 416, 417).

*No. 12.*—Applications of Brunt's Radiation Equation to Minimum Temperature Forecasting, by W. C. Jacobs (pp. 439–443); The Weather of 1939 in the United States (pp. 444, 445), Preliminary Report on Tornadoes in the United States During 1939 (pp. 445, 446), and Duststorms of 1939 in the United States (pp. 446–451), all by R. J. Martin; and North Atlantic Tropical Cyclones of 1939, by W. E. Hurd (p. 451).

**The association of meteorological changes with variations of ionization in the $F_2$ region of the ionosphere,** J. Bannon, A. J. Higgs, D. F. Martyn, and G. H. Munro (*Roy. Soc. [London], Proc., Ser. A, 174 (1940), No. 958, pp. 298–309, pl. 1, figs. 3*).—From a study of the day-to-day variations in the noon values of the maximum electron density in the $F_2$ region of the ionosphere at two stations near Sydney and Canberra, Australia, it was found that the fluctuations were associated with meteorological changes observed at the ground. Over 19 mo. of daily observations on days when the region between latitude 29° and 36° S. and longitude 140° and 156° E. was free from "frontal" conditions, the values of $F_2$ ionization averaged higher by 6 percent near Sydney and 11 percent near Canberra than on other days. A similar average difference was found for each month (except August 1937 and July–August 1938), when a small negative difference occurred at each station. This difference was greatest in the equinoctial months, when it amounted to ± 20 percent for Mount Stromlo. The theoretical difficulties in explaining the association between $F_2$ ionization and meteorological conditions are discussed, and it is pointed out that the current views on seasonal variation in $F_2$ ionization in various regions of the world may require revision. The current view regards $F_2$ region ionization as normally influenced solely by the intensity of solar radiation, thus depending in magnitude solely on latitude. The present results suggest that local climatological factors may exert a profound influence on the magnitude and on the seasonal and diurnal variations in $F_2$ ionization.

**On the conservatism of the equivalent potential and the wet-bulb potential temperatures,** W. Bleeker (*Quart. Jour. Roy. Met. Soc. [London], 65 (1939), No. 282, pp. 542–550, figs. 2*).—"The conservatism of the different equivalent and wet-bulb temperatures and their potential values is discussed, and it is shown that there exists no single equivalent and wet-bulb temperature which is conservative for all three processes: (1) Dry-adiabatic changes, (2) saturated-adiabatic changes, and (3) evaporation of rain falling through the air. . . . This leads to the conclusion that the so-called wet-bulb potential temperature should be carefully handled for identification of moving air masses. . . . The use of the wet-bulb potential temperature may give a wrong impression of the gain of water by evaporation and may lead to erroneous results in estimations of vertical displacements in cases where evaporation occurs."

**The distribution of wet-bulb potential temperature in four selected cyclones,** A. M. FireSah (*Quart. Jour. Roy. Met. Soc. [London], 65 (1939), No. 281, pp. 397–410, figs. 13*).—The distribution of wet-bulb temperature is reported for four cyclones, each by means of serial sounding balloon ascents made at one station. "The results are plotted as though they represented observations along a vertical cross section through the moving cyclone. Lines of equal wet-bulb potential temperature are drawn, and these are found to show a characteristic form of distribution at warm fronts, cold fronts, and occlusions. At warm

fronts the lines are closely crowded together. At cold fronts they show a nose raised some kilometers above the ground, the wet-bulb potential temperature decreasing with height in the air below the nose. The air in this region usually shows marked latent instability capable of being realized after only relatively small upward displacement. At occlusions the lines of equal wet-bulb potential temperature have a pronounced V-shaped form."

**Cyclonic and anticyclonic development,** R. C. SUTCLIFFE (*Quart. Jour. Roy. Met. Soc.* [*London*], *65* (*1939*), *No. 282, pp. 518–524*).—"Development of pressure systems involves horizontal divergence (positive or negative) approximately balanced by divergence of opposite sign in the upper troposphere, the total divergence integrated vertically and represented by the rate of change of surface pressure being a relatively small residual. It follows that a criterion for development is that there should be a significant difference between the lower and upper fields of divergence. Divergence is determined by the field of geostrophic departure or acceleration, and it is shown that the difference between lower and upper divergence consists of two parts due, respectively, to shearing and to the development of thermal gradients. Rules concerning the distribution of surface divergence and convergence in different pressure and temperature distributions are inferred, and a method of approaching the problem of forecasting on a three-dimensional basis is put forward."

**A note on the constancy of horizontal turbulent shearing stress in the lower layers of the atmosphere,** K. L. CALDER (*Quart. Jour. Roy. Met. Soc.* [*London*], *65* (*1939*), *No. 282, pp. 537–541*).—The author presents data to show that the assumption of very small but plausible values for the wind direction change with height in the surface layers (of the order of $10^{-6}$ radians/cm.) suffices to account for the observed wind velocity increase in the lower atmospheric layers. Furthermore, it appears on theoretical bases that the mean wind direction change with height in the lower layers is too small to be observed practically.

**Some factors influencing the development and occlusion of warm sectors,** C. K. M. DOUGLAS (*Quart. Jour. Roy. Met. Soc.* [*London*], *65* (*1939*), *No. 282, pp. 525–531, figs. 4*).—"The initial formation of a warm sector is attributed mainly to geostrophic motion, associated firstly with external systems and secondly with deformation of the warm air mass. The occlusion process is due to a combination of convergence with a suitable distribution of geostrophic motion. The concentration of convergence ahead of the warm front is attributed mainly to the isallobaric effect and not to curvature."

**Tables on sunspot-frequency for 1749–1938,** W. BRUNNER (*Terres. Magnet. and Atmos. Elect.*, *44* (*1939*), *No. 3, pp. 247–256, figs. 2*).—This includes a reprint[3] of a table showing the observed relative Zürich sunspot numbers for 1749–1933, with additions for 1934–38.

**Codes for cloud forms and states of the sky, according to the International system of classification,** I. R. TANNEHILL ET AL. (*U. S. Dept. Agr., Weather Bur. Cir. S* (*1938*), *pp. IV+100, figs. 71*).

**Ecological aspects of meteorology,** E. J. SALISBURY (*Quart. Jour. Roy. Met. Soc.* [*London*], *65* (*1939*), *No. 281, pp. 337–358, figs. 8*).—The author discusses the relative importance of extreme and mean climatic conditions as influencing the persistence of species; the biological significance of temperature summations; the importance of absolute minima in affecting geographical distribution; frost severity in relation to the survival of winter and summer annuals; maximum temperature effects on flower and seed production; the nature of the

[3] Terres. Magnet. and Atmos. Elect., 39 (1934), No. 3, pp. 231–236.

soil surface and its effect on air temperatures; the influence of meteorological conditions on plant life as modified by the biology of the species; the importance of katabatic winds in modifying temperatures affecting plant life; the duration and intensity of sunshine as affecting reproduction (photoperiodism); the roles of precipitation as a source of raw material, as an erosion agent, and in leaching; the significance to plant life of the seasonal incidence and intensity of precipitation; meteorological factors as influencing soil development and the extent of their modification by the plant cover; ecological aspects of wind; the influence of meteorological factors on the conditions of life in relation to the time factor, as illustrated by dune soils; and edaphic succession.

**Effect of the amount and distribution of rainfall and evaporation during the growing season on yields of corn and spring wheat,** F. E. Davis and J. E. Pallesen. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *60* (*1940*), *No. 1*, *pp. 1–23, figs. 3*).—Using the Fisher regression integral for evaluating the effect as a continuous curve, the average effects of additional rainfall on corn yields at Wooster, Ohio, and of additional rainfall and evaporation on spring wheat yields at Dickinson, N. Dak., were determined for any time during the growing season. Improved methods of handling this technic in conjunction with the orthogonal polynomials recently tabulated by Fisher and Yates (E. S. R., 80, p. 572) are presented, and their application to a continuously cropped corn plat indicated that while the total amount of rainfall for the season had little effect on yields, its linear distribution proved important. Additional rainfall was detrimental early in the season, particularly in late May and early June. The positive effects of additional rainfall began in June and continued through August, and it was particularly beneficial in mid-July. In the continuously cropped spring wheat plat the total seasonal rainfall was highly correlated with yields, additional rainfall above the average was beneficial at all times except just previous to the harvest, and the greatest benefits came ± 80 days after seeding, which is ± 20 days previous to heading. While the relationship indicated between evaporation and spring wheat yields was reasonable, it only approached the point of being conclusive.

**The seasonal and geographical distribution of absolute drought in England,** L. F. Lewis (*Quart. Jour. Roy. Met. Soc.* [*London*], *65* (*1939*), *No. 281*, *pp. 367–383, figs. 3*).—Complete lists of absolute droughts at six stations over periods of 80–95 yr. and at three other stations for 43–52 yr. are tabulated and discussed.

**Meteorological records: A fifty-year summary, 1889–1938,** C. I. Gunness (*Massachusetts Sta. Bul. 367* (*1939*), *pp. 23, fig. 1*).—A summary of records at Amherst, Mass., latitude 42°23′48.5″ N. and longitude 72°31′10″ W.

## SOILS—FERTILIZERS

**[Soil investigations of the Missouri Station]** (*Missouri Sta. Bul. 413* (*1940*), *pp. 89–97, figs. 2*).—Crop rotation, fertilizer, and soil management experiments are briefly reported upon by M. F. Miller and H. H. Krusekopf; the fineness of grinding limestone, by W. A. Albrecht; the calcium content of soils and its relation to acidity and the response of soils to liming, by Albrecht and E. R. Graham; the colloidal nature of soil organic matter, by L. D. Baver and N. S. Hall; the measurement of soil structure, by Baver; the nitrogen and carbon in soils under different systems of soil treatment and management, by Miller and Albrecht; the utilization of cornstalks and straw in soil building, by Albrecht and J. C. Wooley; effects of different soil treatments, long continued, upon bacterial activity in the soil, by Albrecht and B. R. Browning; the im-

provement of permanent pastures, by Miller and Krusekopf; and increasing the productivity of Missouri pastures, by Baver and J. B. Page.

Soil erosion and run-off are discussed by Miller, Krusekopf, Baver, and J. H. Neal; and effect of rainfall impact on soil erosion, by Baver and Neal.

**[Soil investigations of the Washington Station].** (Partly coop. U. S. D. A. et al.). (*Washington Sta. Bul. 384* (*1939*), *pp. 17–22, 86–92*).—Notes on fertility investigations of Washington soils are contributed by L. C. Wheeting, S. C. Vandecaveye, and L. E. Dunn; the maintenance of organic matter in eastern Washington soils, by Vandecaveye, Wheeting, and L. T. Kardos; plant composition as influenced by fertilizers and soil type, by Vandecaveye and Dunn; fertility investigations of greenhouse soils, by Wheeting and Dunn; the effect of various cropping systems in the Palouse region upon the leaching through the soil of plant nutrients and other chemical constituents, by Kardos and Vandecaveye; and investigations of the accumulations of arsenical sprays in orchard soils, by Kardos, Vandecaveye, and E. A. Epps.

Studies are noted in soil erodibility, effect of plant cover on run-off and erosion, and relation of cropping practices to erosion control by G. M. Horner; and tillage practices for erosion control and run-off from agricultural watersheds by Horner and L. M. Naffziger. The observational nurseries for herbaceous species and for woody species are discussed by J. L. Schwendiman and A. J. Johnson and by P. E. Lemmon, R. L. Brown, W. E. Chapin, and H. W. Miller, respectively; observational field plantings of herbaceous species, by R. F. Sackman and Johnson, and of woody species, by Lemmon, Brown, Chapin, and Miller; seed increase of foundation stock, by Johnson and Sackman; production of nursery stock, by Lemmon, B. L. Peters, Brown, and Johnson; *Agropyron inerme* and *Poa ampla* as erosion-controlling grasses, by V. B. Hawk; and seed and plant collection and distribution, by L. A. Mullen.

**[Soil investigations at the Western Washington Station]** (*Western Washington Sta. Rpt. 1939, pp. 48, 49–51*).—The comparative value of different phosphates for western Washington soils was studied by K. Baur and L. C. Wheeting; pot culture and the maintenance of organic matter in western Washington soils, both by Baur.

**[Soil Survey Reports, 1933 and 1935 Series]** (*U. S. Dept. Agr., Bur. Plant Indus.* [*Soil Survey Rpts.*], *Ser. 1933, No. 31, pp. 41, figs. 2, map 1; 1935, No. 13, pp. 68, figs. 2, map 1*).—These surveys were made in cooperation with the respective State experiment stations: 1933, No. 31, Scioto County, Ohio, G. W. Conrey et al.; and 1935, No. 13, Cerro Gordo County, Iowa, J. A. Elwell et al.

**A way of sampling soil gases in dense subsoils, and some of its advantages and limitations,** D. Boynton and W. Reuther. (Cornell Univ.). (*Soil Sci. Soc. Amer. Proc., 3* (*1938*), *pp. 37–42*).—The method described consisted essentially in the use of a sampling well of Pyrex tubing 20 mm. in diameter and 75 mm. long, filled with glass wool, open at the bottom and closed at the top by a one-hole rubber stopper through which is inserted the end of a suitable length of ⅛-in. copper tubing. Gas samples are pumped into 35-cc. glass-stoppered bottles by means of a simple mercury pump.

Samples taken after evacuation of 150 cc. were shown to be representative of the zone in which the sampling well is located. Tension of 20 cm. of mercury used in drawing the samples into the bottles could theoretically increase the carbon dioxide content by as much as 2 percent of the total gas

volume, but field studies indicate that in many, perhaps in most, instances the increase in carbon dioxide percentage due to tension is negligible.

**Principles of sedimentation,** W. H. Twenhofel (*New York and London: McGraw-Hill Book Co., 1939, pp. X+610, figs. 44*).—The author, after briefly indicating the general nature of earlier works on this subject, notes that in the present study "emphasis is placed on the concept that sediments are products of heritage and environments, the latter usually the more important. Logical approach to an understanding of sediments and sedimentary processes is thought to be best attained by complete consideration of those environmental factors that have major influence in production, transportation, deposition, and subsequent modification of sediments. The subject is thus entered, and consideration of products is postponed until environmental influences have been explored."

**Soil structure: Attempts at its quantitative characterization,** R. Bradfield and V. C. Jamison. (Cornell Univ.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 70–76, figs. 9*).—The authors discuss the relative merits of simple mechanical analysis, aggregate analysis, total pore-space determinations, and pore-size distribution measurement, preference being given to the last-named criterion. For carrying out this measurement, "the most promising method is based on the simple principle of filling the pores with water, then applying increasing increments of tension and measuring the volume of water that can be withdrawn at each successive tension. The 'equivalent radius' of the smallest pores emptied by any tension can be calculated from the formula for rise of liquids in capillary tubes, and the total volume of pores between the limits emptied by successive tensions can be easily measured." An apparatus for securing accurate data in this way is described, and its general nature is indicated in a diagrammatic drawing.

Discussing the limitations of the pore-size distribution curve as an index of the physical condition of the soil, the authors point out that to characterize adequately the structure of a soil from a practical point of view one must also know something of the force required to change its physical state. Data of the type obtained with the dynamometer or penetrometer are needed to supplement the static picture given by the pore-size distribution curves.

**Further results on the mineralogical subdivision of soil separates by means of heavy liquid specific gravity separations,** R. W. Pearson and E. Truog. (Wis. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 20–25, figs. 2*).—The results of specific gravity separations of various mechanical separates of soil and nontronite are given. Petrographic methods were employed to check the sharpness of the separations in the case of material of particle size greater than 1$\mu$ in diameter. By improved procedure, including the use of centrifuge tube of simpler construction and of larger capacity, quantitative separations of the mineral groups in sand and silt fractions were effected. In the case of coarse clay (particles from 2$\mu$ to 0.2$\mu$ in diameter) the separations were quantitative except for traces of talc and biotite in the lighter fractions. The bulk of the base-exchange material in the Lufkin clay, and in nontronite, was found in the specific gravity fraction 2.18 to 2.33. It was also found that the quantity of minerals of low specific gravity increases greatly with diminishing particle size.

The results indicate that separation by means of the specific gravity procedure outlined offers considerable promise as a means of separating and concentrating the mineral species not only in the coarser but also in the finer soil separates.

**The thermal conductivity of dry soils of certain of the great soil groups,** W. O. SMITH and H. G. BYERS. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 13–19, figs. 5*).—The authors describe an apparatus for determining the thermal conductivity, $k$, in the equation $k=\frac{\frac{Q}{At}}{\frac{T_2-T_1}{d}}$, of a soil sample held in the form of a slab of uniform thickness ($d$) and exactly determined area ($A$) between cold plates of controlled temperature ($T_1$) and a heated plate of which the temperature ($T_2$) and energy supply can be measured accurately, so that the quantity of heat ($Q$) passing during a determined time interval ($t$) may be calculated. A diagrammatic drawing and photograph indicate the general nature of the set-up. Data for a number of soils are given, and, although it is pointed out that "exact mathematical treatment of the problem of heat transmission in a porous body is difficult," an approximate relation is derived.

**Mean effective pore size and clay migration during water percolation in soils,** G. B. BODMAN and E. F. HARRADINE. (Univ. Calif.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 44–51, fig. 1*).—Mean effective pore diameter was calculated for laboratory-packed columns of six soils on the basis of the fractional open area and permeability by water of the water-saturated soils. Pore diameter so calculated influenced the occurrence of particle migration but was not related to its absolute quantity as measured by means of mechanical analyses, apparent densities, and cumulative percolation values. Decreases in water permeability with time appear to be the result of pore blocking in the columns partly by dispersed and deeply migrated, and partly by locally dispersed and locally migrated, fine particles. The amount of the soil-clay illuviation is expressed in terms of a quantity called "intensity of migration," a quantity which is described as depending upon both physical and chemical properties of the soil.

**Soil permeability in relation to non-capillary porosity,** L. D. BAVER. (Ohio State Univ.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 52–56, figs. 5*).—The author reports some preliminary results obtained by the following method: A given volume of soil, about 360 cc., is placed in a brass cylinder and clamped onto a porous plate in contact with a water surface. The tension on the plate is automatically controlled by water suction which operates through a manometer relay system. By using a core sampler which permits the insertion of this brass cylinder, it is possible to obtain a column of soil in its natural structure. After the soil is placed on the porous plate, the column is slowly wetted from below until there is zero tension on the surface of the soil. The withdrawal of water at different tensions up to 300 cm. of $H_2O$ is measured volumetrically in a burette. The apparent and real specific gravities of each soil are determined. The moisture content on a volume basis is plotted against the pF, the logarithm of the tension in centimeters of water. After the withdrawal of water is completed at the highest tension, the entire soil column, with the brass cylinder, is placed on a Büchner funnel, and the percolation rate of water through the soil at a head of about 6 mm. is determined. This permits obtaining the permeability of the soil under the same structural conditions as the moisture-tension curve.

**The determination of soil moisture energy relations by centrifugation,** M. B. RUSSELL and L. A. RICHARDS. (Iowa Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 65–69, figs. 3*).—The authors designed a centrifuge cup in

which water-saturated soil may be subjected to a known centrifugal field in the absence of any other cause of change in moisture content. With the apparatus used and under the experimental conditions stated, no further loss of moisture due to the centrifugation occurred after about 2 hours' operation of the centrifuge. The curves of percentage of moisture plotted against capillary potential were obtained for four soils.

**Soil moisture content calculations from capillary tension records,** S. J. RICHARDS (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 57–64, figs. 7*).—The author shows the mathematical basis for a method whereby the quantity of water, or the change in the quantity of water, held in a column of soil may be calculated from capillary tension records. The calculations require a knowledge of the functional relation between tension and the moisture content for the particular soil in question.

A pressure cell employing a porous ceramic wall for obtaining curves relating tension and moisture content over a tension range greater than 1 atmosphere is described. Experimental curves relating moisture content and tension are given for four soil types, all of which show a measurable hysteresis loop. Effects of the compaction of the soil on this relation were observed. With enough data available it was assumed that a single-valued relation between tension and moisture content would be chosen which would be valid during a given period of wetting or drying. Continuous records of capillary tension were obtained at four depths in a 1-ft. column of sand for various conditions of capillary flow in the sand. These records and the data from the hysteresis curves for a sample of the same sand were used in the indicated calculations. One computation, made for the total quantity of water present in the sand column, was accurate within 5 percent.

**Oxidation and reduction potentials as related to soil characteristics and plant growth,** N. J. VOLK. (Ala. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), p. 122*).—The variations in Eh in arable Alabama soils were found not to be directly related to plant growth, and the Eh was not a reliable index of the state of oxidation or reduction in the soil. "It is not concluded that oxidation and reduction in soils bears no relation to plant growth, but that if a relation does exist, it is not directly associated with soil Eh."

**The effects of cropping and manure applications on some physical properties of a heavy soil in eastern Nebraska,** B. R. BERTRAMSON and H. F. RHOADES. (Nebr. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 32–36, figs. 2*).—Manure had no appreciable effects on the consistency constants, the moisture constants, the volume weight, or the aggregation.

For the first 6-in. depth, the values for the uncultivated soil exceeded the average values for the cropped soil as follows: (1) The upper plastic limit, 9.8 percent, (2) the lower plastic limit, 6.9, (3) the plasticity number, 2.9, (4) the scouring point, 7.4 (5) the moisture equivalent, 6.9, (6) the hygroscopic coefficient, 1.2, and (7) the maximum water capacity, 16.2 percent. The average degree of aggregations for the cultivated soils was 73 percent of that for the uncultivated soil. The great difference was in the aggregates larger than 0.5 mm. The cultivated soil had only 12.8 percent as many aggregates larger than 0.5 mm. as were found for the uncultivated soil.

Air-drying the soil greatly decreased the size of the aggregates.

**Changes in the soil of the Morrow plots which have accompanied long-continued cropping,** E. E. DETURK. (Ill. Expt. Sta.). (*Soil Sci. Soc. Amer Proc., 3 (1938), pp. 83–85*).—This note is an abstract of a fuller report on crop-yield trends under various treatments of plats under continuous experimentation since 1876.

**Some microbiological aspects of the Morrow plot soils,** M. D. APPLEMAN and O. H. SEARS. (Ill. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), p. 86*).—This note is a brief abstract of a fuller report.

The plat growing corn continuously and without soil treatment produced the lowest yield of corn and contained the smallest number of soil micro-organisms. The capacity of the soil to nitrify its organic matter as well as ammonium sulfate and to produce carbon dioxide was also lowest on the least productive plat. The plat receiving a soil treatment of manure, limestone, and phosphate in the corn, oats, clover rotation produced the highest yield of corn and ranked at the top in the activity of its soil microflora.

The morphological characteristics of the soil micro-organisms have not been affected appreciably by soil treatment and crop rotation as indicated by the Rossi-Cholodny technic. Although some plats have a pH below 5.8, *Azotobacter* were found in the soils from all plats by the soil plaque method. Isolations were made also from each plat using a nitrogen-free mannitol medium.

**Variable levels of biological activity in Sanborn Field after fifty years of treatment,** W. A. ALBRECHT. (Mo. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 77–82*).—The author considers that wide differences in organic-matter content of a soil under various treatments indicate differences in the rate of consumption of the organic residue by micro-organisms, and attributes this, in turn, to varying deficiencies in bacterial nutrient requirements under the various soil treatments. Where organic-matter consumption has been low, some of the suggested deficiencies are nitrogen, calcium, and phosphates. Potassium sufficiently readily available to serve bacterial needs may also be deficient. Where these have been added as soil treatments, the total supply of organic matter has been reduced. The increased crop returns, running parallel with organic-matter reduction in the soil, "suggest strongly that where the organic-matter fraction of the soil is not breaking down it is being retained at modest levels because these mineral elements are too deficient in the soil for the microbiological processes. They are then consequently deficient in the soil for the plants' activity on a high level. Such conditions suggest that when these deficient nutrient items are delivered by the soil to the plant, they may come in the main from the more slow decay of the more stable organic matter."

**Distribution and activity of Azotobacter in the range and cultivated soils of Arizona,** W. P. MARTIN (*Arizona Sta. Tech. Bul. 83 (1940), pp. [2]+333–369, figs. 4*).—Of the 94 samples of cultivated soils collected 82, or 87 percent, contained *Azotobacter*, and the bacteria were generally active, as indicated by an average fixation of 19.6 mg. of nitrogen per gram of soil tested. Of 119 range soils only 27, or 22.7 percent, contained any of the organisms, and they were usually inactive, as indicated by an average fixation of but 5.3 mg. of nitrogen per gram of soil tested.

Multiple regression statistics showed that the water-soluble sodium and calcium contents of Arizona's cultivated soils were most closely associated with the activity of the *Azotobacter*. Little correlation was found with the soluble magnesium and phosphate contents of the samples or with pH, and the chloride and sulfate contents were associated only by virtue of their close correlation with calcium and sodium. A study of the limiting sodium and calcium contents for *Azotobacter* in the cultivated soils indicated that when the soluble sodium and calcium approached 3,000 p. p. m. or above the *Azotobacter* probably would not be found, whereas soils with values less than this amount may contain the organisms, and that the lower the contents of soluble calcium and sodium, the more active the *Azotobacter* may be expected to become.

Use was made of a discriminant function to determine whether or not the range soils which contained *Azotobacter* differed significantly in their pH, available phosphorus, and total soluble salt contents from the samples containing none of the organisms. It was concluded that factors other than these were the ones limiting the growth of *Azotobacter* in the range soils tested. In the case of the Shantung brown range soils, however, significantly higher contents of soluble phosphorus and the more alkaline reactions were associated with the soils which contained the *Azotobacter*. The total soluble salt contents were of little significance. It is further pointed out that inferences from the results with range soils "should be drawn with extreme caution," since it was not possible to consider with this type of experiment important limiting factors such as the moisture and available supply of energy-yielding materials, both of which are very low during a large part of the year in the red-yellow desert soils and to a lesser extent in the Shantung brown soils.

**Crops against the wind on the southern Great Plains,** G. K. Rule (*U. S. Dept. Agr., Farmers' Bul. 1833 (1939), pp. [4]+74, figs. 44*).—The agricultural history of the southern Great Plains area is outlined, with special reference to the factors, such as overgrazing, improper tillage methods, inadequate moisture conservation, and the plowing up of soils climatically or otherwise ill adapted to cultivated crops, which have contributed most importantly to the development of wind-erosion and duststorm hazards. The usually recommended present methods of soil and moisture conservation are discussed, together with the tillage implements best adapted to the work. Both crop management and range management are taken up, as are also the results secured on a number of demonstration areas.

**Studies of hydrolysis effects upon soil colloids.—I, Hydrolysis of various colloids with water and the hydrolysing medium—a preliminary report,** E. A. Fieger and J. E. Simpson. (La. State Univ.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 94–99, figs. 4*).—The hydrolytic action of water upon soil colloids saturated with various single cations has some effect upon the pH. Hydrogen colloid is the most stable, and calcium colloid is next in stability to hydrolysis, this being directly correlated with their energies of absorption. The magnesium, potassium, and sodium colloids are the most unstable to hydrolysis. The soluble silicon content apparently is most affected by cations which give systems at the extremes in the pH range, the sodium and hydrogen colloids yielding the greatest amount of soluble silicon.

Hydrolysis under the conditions of this experiment does not affect the iron content in such a way as to yield water-soluble iron products.

The same order of ability to yield aluminum is observed as in the ability to yield soluble silicon, the cations displaying extremes in pH having the most effect. However, the aluminum does not increase with time of hydrolysis but apparently very quickly establishes an equilibrium peculiar to the cation used in saturation.

**Plant growth and the breakdown of inorganic soil colloids,** W. A. Albrecht, E. R. Graham, and C. E. Ferguson. (Univ. Mo.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), p. 100*).—Soybean plants grown in mixtures of quartz sand and colloidal clay removed 2.21 percent of the silicon, 1.95 of the aluminum, and 3.14 percent of the iron originally present in the clay. When the clay content of the medium was doubled the silica content of the crop was multiplied by 1.79, the aluminum content by 3, and the iron content by 1.91. Carbon dioxide treatment liberated less than 0.2 percent of silicon, aluminum, and iron. "The plant, therefore, represents conditions for liberation of ions from the clay far different than simple carbon dioxide extraction."

**The influence of soil colloids on the toxicities of sodium selenate and sodium selenite for millet,** P. L. Gile and H. W. Lakin. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 92, 93*).—In sand-soil mixtures containing 1 percent of soil colloids sodium selenate was fully as toxic as in quartz sand, and in whole soils the selenate was only a little less toxic than in quartz sand. The experiments show clearly, however, that soil colloids have a marked effect on the availability or toxicity of the selenite ion, that the effect varies with the kind of colloid, and that toxicity of the selenite is not affected by the sulfate supply providing sufficient is available for maximum growth.

**Studies on infertile soils.—II, Soils high in barium,** W. O. Robinson, R. R. Whetstone, and H. G. Byers. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 87–91*).—The present paper notes a continuation of the work of Robinson et al. (E. S. R., 73, p. 447). A number of soils very high in barium were analyzed chemically and the exchangeable bases and other constituents determined by leaching with ammonium acetate solutions. The soils contained from 0.08 to 3.74 percent barium calculated as the oxide. Some of the most fertile soils contained the most barium, but in these soils the barium was mainly present as barite and there was an excess of soluble calcium and magnesium over soluble barium. Most of the infertile soils of high barium content contained an excess of barium over sulfur, and in these soils the soluble calcium and magnesium were low and nearly equaled or exceeded by the soluble barium.

**The relation of hydrogen-ion concentration to the availability of zinc in soil,** W. L. Lott. (Cornell Univ.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 115–121, figs. 7*).—The author reports upon experiments showing that the growth of oat seedlings in Westmoreland silt loam, more acid than pH 6.0, may be materially retarded by the presence of a few hundred parts of zinc per million parts of soil. However, the detrimental effects of 800 parts per million were prevented in three different samples of soil by incorporating sufficient calcium carbonate to reduce soil acidity to that corresponding to pH 6.0. The results of analysis of the tops of oat seedlings indicate that the concentration of zinc in the soil solution is decreased to nontoxic level in the neighborhood of pH 6.0 and approaches a minimum at pH 6.5. Some practical implications of these findings are discussed.

**The effect of alternate drying and wetting on the base-exchange complex with special reference to the behavior of the K-ion,** J. S. Joffe and L. Kolodny (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 107–111*).—The authors heated certain soils and the soil mineral montmorillonite to various temperatures, subjected them to alternate wetting (either with potassium chloride solution or with water) and drying, and then leached with neutral (pH 7.0) normal ammonium acetate to remove all traces of exchangeable potassium. The potassium fixed was determined by difference. Somewhat similar work on soils developed from greensand marl and from glacial limestone drift, respectively, is also recorded. In the experiments on these soils, base-exchange capacity was determined by the barium acetate method. In these soils the quantity of fixed potassium was not equivalent to the decrease in exchange capacity. The major decrease in exchange capacity was due to heating. It was also noted that the order of the fixed potassium values was very high, an effect attributed tentatively to the high temperatures of fixation and heavy KCl treatments; that the decrease in exchange due to potassium fixation occurred in the B and C horizons; and that the A horizon does not seem to decrease in exchange capacity due to potassium fixation. The significance of these and some related observations is discussed theoretically.

**The release of potassium from non-replaceable forms in Illinois soils,** R. H. BRAY and E. E. DETURK. (Ill. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 101–106*).—The authors report upon experiments indicating that the release of K from nonreplaceable forms during moist storage follows readily upon the removal of all or a part of the original replaceable K, that the release of K from nonreplaceable forms under the same conditions but where no K has been added or removed is generally very small or negligible, that increasing the replaceable K by addition of a potassium salt under similar conditions of moist storage results in part of the replaceable K being changed over to a nonreplaceable form, and that heating at 200° C. results in release or fixation of K, depending on the equilibrium conditions at the beginning of the heat treatment.

To account for the fixation of potassium added to the soil and the replenishment of the readily replaceable potassium, they put forward "the possibility that there are formed during weathering in the soils secondary minerals which have the property of holding potassium and probably other bases, in a form which has generally been designated as 'fixed.' We may consider this form as very difficultly replaceable. According to the equilibrium studies . . . the conversion of K from the fixed to the easily replaceable form is extremely slow compared to the usual base-exchange reactions in either the zeolitic or montmorillonitic type of material. This would be expected if a more compact structure is present in the secondary materials we are postulating." This theory is briefly discussed.

**The effect of iron on some physico-chemical properties of bentonite suspensions,** J. F. LUTZ. (N. C. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 7–12, figs. 7*).—The Fe was nearly all adsorbed from additions of $FeCl_3$ up to 2.5 symmetry concentration, in the presence of HCl, indicating that $Fe^{+++}$ is much more strongly adsorbed than $H^+$ at the existing pH values. After washing the pH of all suspensions was approximately 3.90. An increase in Fe adsorption appeared to be associated with an increase in $Cl^-$ adsorption, but not as a linear function. This is explained as a division of the Fe valences between the micelle and the $Cl^-$, shifting in favor of the $Cl^-$ as $Fe^{+++}$ formed the inner layer. This increase in the anion exchange capacity "probably explains the observation that soils high in Fe fix large amounts of phosphate."

Swelling of the dried colloid and hydration of the suspended colloid were more nearly proportional to the Cl : Fe ratio than to the total Fe. Low Cl : Fe ratios were associated with low hydration and little swelling. The hydration and swelling and the $Cl^-$ adsorption data indicate that Fe is probably a very important factor influencing certain physicochemical properties of lateritic soils.

The red and yellow color was found not to be directly proportional to the amount of Fe present.

**A report of phosphate investigations in Montana for 1939,** W. P. WILLIS, JR., and F. M. HARRINGTON (*Montana Sta. Bul. 378 (1940), pp. 16, figs. 5*).—The experiments reported upon in the first part of this bulletin yielded the following results for various crops: Treble superphosphate applied at the rate of 60 lb. per acre to dry-land wheat gave equal or larger yield than 125 lb. per acre in five out of seven trials in 1939. When applied at the rate of 100 lb. per acre to the sugar beet crop on the Sun River irrigation project, treble superphosphate gave a 30 percent increase in the yields of beets as compared to 28 percent increase for free acid treble superphosphate. The residual effect of treble superphosphate after 1 or 2 yr. was very marked in 1939 trials. The third crop of alfalfa after the application of the phosphate was increased from 50 to 200 percent compared

to the plats without this fertilizer. Surface application of treble superphosphate to pasture grasses gave a decided increase to the percentage of phosphorus found in the grass grown through the year. Preliminary tests showed that phosphorus applied to a summer fallow in the spring produced considerable increase in the nitrates of the soil as compared with a nonfertilized area. In another preliminary test varying quantities of treble superphosphate, applied with sugar beet and wheat seeds at the time of seeding, showed no effect on germination or stand of the seedlings.

In part 2 the bulletin reports similar results in the use of phosphates for potato production. All forms of phosphate give equivalent returns with potatoes if the phosphate is measured on the basis of the percentage of available phosphate.

**Long-time results of fertilization show injury from acid-forming fertilizers, need for neutral materials, applied lime,** W. B. ANDREWS (*Miss. Farm Res.* [*Mississippi Sta.*], *3* (*1940*), *No. 3, p. 8*).—The well-known properties of various fertilizer components, with respect to soil acidification, are stated, with estimates of the acid-producing or acid-neutralizing equivalent of 1 ton of each expressed in terms of lime consumed or lime added.

**Watch fertilizers when tendency is to reduce amounts,** W. B. ANDREWS (*Miss. Farm Res.* [*Mississippi Sta.*], *3* (*1940*), *No. 3, p. 1*).—The tendency to use cheaper, and often inadequate, fertilizers in the year following a very bad crop, such as that of last year in the northern part of Mississippi, is pointed out, and fertilizer mixtures which lower the cost without sacrificing the necessary minimum of deficient plant-food elements are suggested.

**Inspection of commercial fertilizers,** H. D. HASKINS (*Massachusetts Sta. Control Ser. Bul. 100* (*1939*), *pp. 50*).—Statistics concerned with total tonnage, the tonnage in each of various grade and type classes, and other information accompany the report, for 1939, of the usual analytical data (E. S. R., 80, p. 739).

**Inspection of agricultural lime products,** H. D. HASKINS (*Massachusetts Sta. Control Ser. Bul. 101* (*1939*), *pp. 10*).—This twenty-eighth report on the inspection of agricultural lime products in Massachusetts gives the customary analyses (E. S. R., 81, p. 346) of the various products which have been sold in the State during the year 1939.

## AGRICULTURAL BOTANY

**[Botanical contributions from Kansas]** (*Kans. Acad. Sci. Trans.*, *42* (*1939*), *pp. 133–149, 157–201, 207, 208, figs. 11*).—The following contributions are of interest to agricultural botany: Kansas Botanical Notes, 1938, and New Forms and Nomenclatorial Combinations in the Kansas Flora, both by F. C. Gates (Kans. State Col.); Flora of Saline County—Ferns and Flowering Plants, by J. Hancin; A Preliminary Survey of the Flora of Crawford County State Park, Kansas, by B. Ross and H. H. Hall; The Disappearance of a Society of *Camassia esculenta* Following the Burning Over of Its Prairie-Meadow Habitat and *Croton monanthogynus* and *Lespedeza striata* as Bank Covers, both by W. C. Stevens; The Seed Plants of Sedgwick County, Kansas, by M. A. Stieferman; The Fleshy Fungi of Crawford County, Kansas, by G. Travis and H. H. Hall; and *Festuca octoflora* var. *hirtella*, a New Grass for Kansas, by J. Webb.

**Gentes Herbarum.—Arts. 26–31, Occasional papers on the kinds of plants,** L. H. BAILEY (*Ithaca, N. Y.: Bailey Hortorium, 1940, vol. 4, No. 9, pp. 317–354, figs. 26*).—The following taxonomic papers are included: Certain noteworthy Brassicas, novel chrysanthemum species, *Phaseolus lunatus* and relatives, neglected Jasminums, new genus in Sterculiaceae (*Sitella* n. gen. segregated from *Waltheria*), and two Pseuderanthemums and notes on nomenclature.

**Keys to the woody plants of Iowa in vegetative condition,** H. D. HARRINGTON (*Iowa Univ. Studies Nat. Hist., 17 (1940), No. 9, pp. [3]+375–489, figs. 50*).—There are said to be ±200 species and varieties of woody plants native to Iowa, with about an equal number found only in cultivation. The purpose of this manual is to aid in identifying these plants by use of such vegetative characters as leaves and twigs, which are present throughout the growing season. An attempt has been made to include all native species reported for the State, where the record is not subject to question, and it is hoped that almost all of the common cultivated species have also found their way into the keys.

**Studies in the Crassulaceae: Villadia, Altamiranoa, and Thompsonella,** R. T. CLAUSEN. (Cornell Univ.). (*Bul. Torrey Bot. Club, 67 (1940), No. 3, pp. 195–198*).—A taxonomic study of the history and status of these genera, including *V. elongata* n. comb.

**Studies in the genus Scirpus L.—I, Delimination of the subgenera Euscirpus and Aphylloides,** A. A. BEETLE. (Univ. Calif.). (*Amer. Jour. Bot., 27 (1940), No. 2, pp. 63, 64*).—"The widely accepted subgenera Euscirpus and Isolepis of the genus *Scirpus*, based on the absence or presence of perianth bristles, are found untenable. Subgenera Euscirpus, redefined, and Aphylloides, newly proposed, are set up, based upon the nature of the involucre and the relative development of the cauline leaves."

**Characterization of species and hybrids of the genus Vitis** [trans. title], A. RODRIGUES (*Agron. Lusitana, 1 (1939), No. 3, pp. 315–326, pls. 2, figs. 3; Eng. abs., pp. 325, 326*).—A method is presented for classifying species and hybrids of *Vitis*, based on leaf shape. Using the midrib as a common side, three "main triangles" are plotted. By statistical methods the similarity and dissimilarity of these triangles are determined for the same and for different varieties. Examples are given and illustrated.

**Plant succession due to overgrazing in the Agropyron bunchgrass prairie of southeastern Washington,** R. F. DAUBENMIRE. (Univ. Idaho). (*Ecology, 21 (1940), No. 1, pp. 55–64, figs. 6*).—During the period of settlement of this area the bunchgrass prairies, which covered large parts of this region, were used chiefly for grazing cattle. As a result of long-continued heavy grazing, the appearance and forage value of the primeval prairie have been considerably changed. The bunchgrass, a climatic climax, has undergone a retrogression which in many cases has culminated in a biotic climax which is as permanent as the present system of spring-fall sheep grazing. This vegetational retrogression was investigated. In different areas there exist fragments of the climatic climax in essentially virgin conditions, several stages of retrogression, and in some cases the end point in this biotic succession appears to have been attained. These studies, together with other observations, are believed to bring out the fact that the ecologic responses of several plants in Washington State differ from their responses in other parts of the western United States, as indicated by the literature. Four plants deserve special mention in this connection, viz, *Salsola kali*, *Bromus tectorum*, *A. spicatum*, and *Artemisia tridentata*. Discussing the results in detail, it is concluded that the climatic data indicate that sufficient differences in climate may exist to account for the different ecologic responses of *Agropyron*, *Artemisia*, and other associated plants in Washington and in regions farther south.

**Some water relations of three western grasses, I–III,** L. F. BAILEY (*Amer. Jour. Bot., 27 (1940), Nos. 2, pp. 122–128, figs. 6; 3, pp. 129–135, figs. 5*).—Three papers are presented.

I. *The transpiration ratio.*—*Agropyron smithii*, *A. ciliare*, and *Bromus marginatus*, three grasses suitable for soil conservation projects in the semiarid

grasslands, were grown in large sealed metal cans to which water was added frequently, the experiments reported being conducted under field conditions in an exposed site (1937–38). The transpiration ratio (ratio between amount of water transpired during plant growth and weight of dry matter produced) is expressed both on the basis of total and of top growth, figures based on the former proving ±50 percent lower. Since roots and rhizomes comprised about one-half the total growth of these grasses, their transpiration ratios should be based on total growth, at least when evaluating them for soil conservation purposes in semiarid areas. *A. smithii* proved most efficient in water use on the total dry weight basis but was least efficient on the basis of tops alone. *A. ciliare* had the lowest ratio on the basis of tops but compared less favorably with the other two species as judged by total dry matter. *B. marginatus* used water inefficiently under all conditions tested. Although these grasses were less efficient in water use than grain crops such as wheat, their marked subterranean growth renders them superior for soil conservation. They used water more economically at 19 percent soil moisture than at 30 percent. By growing the plants in two different soils, the transpiration ratio for each species was materially altered.

II. *Drought resistance.*—*A. smithii* lost ±41.6 percent, *B. marginatus* ±49.1, and *A. ciliare* ±50.3 percent, respectively, of their total water content before permanent wilting ensued, these values indicating only a moderate ability to withstand drought without injury.

III. *Root developments.*—The subterranean parts of all three species remained dormant over 6 mo. of severe drought and produced new shoots after addition of water to the soil. After another 6-mo. drought only *A. smithii* resumed growth after adding water to the pots. Root bisects of field plants of the three grasses indicated that a large percentage of the roots of each occurred in the upper 20 cm. of soil. From the standpoints of root surface, spread of surface roots, and depth of rooting, *A. smithii* proved to be the most desirable of the three species for soil conservation usage.

**The mechanism of cell division and the morphological bases of cytology,** A. CONARD (*Sur le mécanisme de la division cellulaire et sur les bases morphologiques de la cytologie. Bruxelles: Univ. Libre Bruxelles, 1939, pp. [2]+186, [pls. 5], figs. [43]*).—A monograph based on studies of species of *Degagnya* and *Spirogyra*, with a bibliography of ±10 pages.

**Size of nuclei in the shoot of Ricinus communis,** F. M. SCOTT. (Univ. Calif.). (*Bot. Gaz., 101 (1940), No. 3, pp. 625–636, figs. 7*).—The volume of nuclei of spiral elements and diameters of spiral vessels, the nuclei of vessel segments and of parenchyma, the nucleolus, the cytology of the nuclei, and the time of mitotic division were studied and are discussed in detail.

**Histogenesis and morphology of the phyllode in certain species of Acacia,** N. H. BOKE. (Univ. Calif.). (*Amer. Jour. Bot., 27 (1940), No. 2, pp. 73–90, figs. 36*).—From the histogenic and morphological study and review (37 references) presented, it is believed that all evidence indicates acacia phyllodes to be homologous with the petiole-rachis of a pinnate foliage leaf and the apical pointlet, if not merely a physical apex, to be nothing more than an abortive terminal leaflet.

**The fine structure of phloem fibres.—I, Untreated and swollen hemp,** B. C. KUNDU and R. D. PRESTON (*Roy. Soc. [London], Proc., Ser. B, 128 (1940), No. 851, pp. 214–231, pls. 2, figs. 4*).—This is an anatomical study of the "bast" fibers of *Cannabis sativa*, which appear to occur only in the phloem tissue and are to be considered as primary or secondary according to whether they develop from procambium or from cambium. With both classes an attempt is made to

establish a connection between the various swelling phenomena and to contrast these with the structure of the intact wall as derived by a variety of methods. It has become clear that the presence of substances other than cellulose profoundly influences the results of the swelling process. It is stated that in hemp we have the clearest evidence that the bulk of the primary wall is composed of longitudinally directed cellulose chains, though there may occur layers whose chain direction differs.

**Mitochondria in plants**, E. H. Newcomer. (Pa. Expt. Sta.). (*Bot. Rev., 6 (1940), No. 3, pp. 85–147*).—In this monographic review (322 references) the author discusses the history, origin, physical and chemical nature, and functions (plastid formation, secretion, respiration, enzymic function, symbionticism, plasmon, and other functions) of mitochondria in plants and ends with a general critique on their present status. It is concluded that "there has been a plethora of isolated investigations and interpretations, but no new experimental technic has brought us noticeably nearer to a solution of the problem. . . . Opinion is still divided concerning them, and there is an equivalence of testimony thus far for many theories."

**Regeneration in the scale leaf of Lilium candidum and L. longiflorum**, R. I. Walker. (Univ. Wis. et al.). (*Amer. Jour. Bot., 27 (1940), No. 2, pp. 114–117, figs. 12*).—Detached fleshy scale leaves of these two species produced small bulblets on the basal portion of the adaxial surface of the scale after planting in sand or sphagnum. The bud primordium arises first from the parenchymatous cells near the adaxial scale surface. Later, the root primordium arises from a group of similar cells below the bud primordium and adjacent to a vascular bundle. The vascular system of the young bulblet is independent of that of the parent scale.

**Buried viable seeds in a successional series of old field and forest soils**, H. J. Oosting and M. E. Humphreys (*Bul. Torrey Bot. Club, 67 (1940), No. 4, pp. 253–273, figs. 2*).—"To determine possible relations between buried seeds and past and future vegetation, soil samples were taken from a series of abandoned fields of known age and vegetative composition, a field under cultivation that season, fields fallow for 1, 2, and 5 yr., shortleaf pine stands of 15, 33, 58, 85, and 112 yr. of age, and an oak-hickory forest. All stands had previously been studied phytosociologically, and it is known that the series is representative of old field succession in the area." Under greenhouse conditions for 37 weeks the samples produced 5,989 seedlings representing 127 species, of which 16 were woody. The highest total germinations were from the field abandoned only 1 yr., while the 5-yr. field produced the largest number of species. Germination of seeds of several species in soil from habitats in which the parent plants do not grow suggested the possibility that under natural conditions seeds may lie buried and viable for long periods. It is deemed probable that some seeds lose their viability under natural conditions, since several species very numerous in the stands of one age class produced few or no germinations in soil samples from the next succeeding class. Statistically analyzed, the distribution of significant species served to emphasize a relationship between vegetation and buried seed, the distinctness of *Andropogon* fields, a difference between field and forest and between pine and hardwood, and that forest seeds apparently require forest conditions to retain their viability. The germinations indicated the presence of viable seeds in the soil of all age classes sampled, but age and origin of seeds remained problematical. They showed a succession of species, as do plants above ground, and, in general, they were indicative of that same succession.

**Avena coleoptile assay of ether extracts of nodules and roots of bean, soybean, and pea**, G. K. K. Link and V. Eggers (*Bot. Gaz., 101 (1940), No. 3,

*pp. 650–657*).—Ether extracts of bean and pea nodules proved more active in inducing negative curvatures in the coleoptile test than extracts of denodulated roots, and these in turn were more active than those of roots grown in sterilized quartz sand. The same relations, but less marked, were found for nodules and roots of soybean. The negative bending activity of extracts of pea and bean nodules and of sterile pea roots was increased by agar dilution. This dilution effect was most pronounced in the pea and bean nodule extracts, and its possible mechanism is discussed. Bean nodule and root extracts contained a fraction behaving like auxin a in acid hydrolysis, the nodule extract containing more of it than the root extract. These extracts also contained a fraction auxinic after alkali hydrolysis, the nodule extract again containing more than the root extract. It is inferred that the nodules of these three plants have greater and different auxone contents than the roots bearing them, and that these in turn have greater and different auxone contents than the roots when grown in sterilized substrates.

**Light stability of auxin in Avena coleoptiles,** W. S. Stewart and F. W. Went (*Bot. Gaz., 101 (1940), No. 3, pp. 706–714*).—"Auxin, once it has been extracted from plant tissues, is stable in light. As shown by ether extractions, 19 percent of the auxin inside the plant is inactivated by sunlight or incandescent electric light (23.5 percent inactivated, omitting negative cases). There is no corresponding decrease in the case of free-moving auxin."

**Interrelations in the effects of boron and indoleacetic acid on plant growth,** F. M. Eaton. (U. S. D. A.). (*Bot. Gaz., 101 (1940), No. 3, pp. 700–705, fig. 1*).—The work with young cotton plants reported appears to indicate that indoleacetic acid will to some extent replace boron as an element essential to growth of root, stem, and leaf tissues. The results suggested that B is essential to the formation of auxin in plants.

**The influence of some plant hormones on the development of cuttings of red clover and alfalfa,** F. Nilsson and E. Andersson (*Nord. Jordbrugsforsk., 1939, No. 6, pp. 393–418, figs. 4; Eng. abs., pp. 416–418*).—Treatments with naphthaleneacetic, indolebutyric, and indoleacetic acids at 2–10 p. p. m. gave favorable effects on both number and length of roots, the last named the best results with red clover and the first with alfalfa, both at 10 p. p. m.

**The wound hormones of plants.—IV, Structure and synthesis of a traumatin,** J. English, Jr., J. Bonner, and A. J. Haagen-Smit (*Jour. Amer. Chem. Soc., 61 (1939), No. 12, pp. 3434–3436*).—Continuing this series (E. S. R., 82, p. 26), "the crystalline substance isolated from string bean pods and capable of inducing renewed cell division and cell extension activity in the parenchymatous cells of the bean pod mesocarp is shown to be 1-decene-1,10-dicarboxylic acid. Synthetic 1-decene-1,10-dicarboxylic acid was prepared and shown to be identical with the natural product both in physical properties and in physiological activity. It is proposed that the name 'traumatic acid' be used in referring to this substance. Traumatic acid is also shown to be capable of inducing wound periderm formation in washed disks of potato tuber and to function thus as a wound hormone of the potato. Traumatic acid is also capable of partially replacing the juice of the tomato fruit in reversibly inhibiting the germination of tomato seeds."

**Intercellular wound hormones produced by the toxic effect of heteroauxin,** J. R. Loofbourow and C. M. Dwyer (*Studies Inst. Divi Thomae, Athenaeum Ohio, 2 (1939), No. 2, pp. 155–163, figs. 5*).—From the experiments reported, the authors believe that heteroauxin is toxic to yeast and that when used in sufficiently toxic concentration it leads to production of proliferation-promoting factors, or wound hormones, by the yeast cells. Whether this material or materials is identical with the wound hormone produced by ultraviolet

light, which preliminary chemical studies have indicated to be somewhat like nucleic acid, remains to be shown.

**Effect of chloropicrin in the soil solution on plant growth**, F. L. STARK, JR., F. L. HOWARD, and J. B. SMITH. (R. I. Expt. Sta.). (*Plant Physiol., 15 (1940), No. 1, pp. 143–145, fig. 1*).—Using the sand-culture solution technic with drip culture pots sown to buckwheat, the results obtained appeared to indicate that traces of chloropicrin in the soil solution are detrimental rather than stimulative to plant growth.

**The Helianthus test**, W. A. BECK and M. W. DONNELLY (*Studies Inst. Divi Thomae, Athenaeum Ohio, 2 (1939), No. 2, pp. 179–188, fig. 1*).—"If seedlings (4.5 cm. high) are raised from equally large seeds not over 1 yr. old and of the same strain, under controlled conditions (temperature 25° C. and 95 percent relative humidity), and the cotyledons and the uppermost 5 mm. of the hypocotyl are removed, the next zone, about 1.5 mm. in length, should serve as an excellent indicator of growth stimulation. The enlargement in this zone can be determined satisfactorily and conveniently with a measuring microscope."

**[Papers on solution culture methods]** (*C. R. E. A. News Letter [Chicago], No. 17 (1938), pp. 12–27, figs. 9*).—The four papers listed below discuss types of plant culture in nutrient solutions or in nutrient-irrigated sand or cinders: Growing Plants Without Soil by the Water-Culture Method, by D. R. Hoagland and D. I. Arnon (pp. 12–21) (Univ. Calif.); Crop Production Without Soil, by W. E. Tottingham (pp. 21, 22) (Univ. Wis.); Indiana Nutrient Solution Methods of Greenhouse Crop Production (pp. 22–25) (Purdue Univ.); and New Jersey Methods of Growing Plants in Solution and Sand Cultures (pp. 26, 27) (Rutgers Univ.).

**Responses of the bean plant to calcium deficiency**, H. GAUCH (*Plant Physiol., 15 (1940), No. 1, pp. 1–21, figs. 17*).—Responses of Dwarf Red Kidney bean plants to various concentrations of single salts and to various two-salt combinations (made up on the basis of results with single salts) are reported. As a result of these and other studies, plus- and minus-calcium solutions (B+ and B−) especially adapted to beans were devised, in which there was no apparent excess or deficiency of essential ions other than Ca. The responses of beans to two types of solutions were studied, viz, Nightingale's, et al., with and without Ca solution (A+ and A−) and the plus- and minus-Ca solutions adapted to beans (B+ and B−). Beans growing in the A− solution continued to absorb ash constituents but failed to absorb nitrates. Those growing in the B− solution absorbed appreciable amounts of nitrates, and the increases in dry weight, total N, and ash of these plants were parallel. Dry weight, total N, and ash of the cotyledons from plants in the B− solution decreased markedly in amount, while these fractions decreased very slightly with the A− solution. Beans with cotyledons intact lived ±6 days in the A− solution and 12 days in the B− solution. There appear to be no ratios, e. g., Ca:Mg or Ca:K, that are optimum for growth over a range of concentrations of salts. There are 19 references.

**Phosphorus absorption by wheat as influenced by applications of lime and phosphorus**, A. T. PERKINS, W. H. METZGER, and H. H. KING. (Kans. Expt. Sta.). (*Kans. Acad. Sci. Trans., 42 (1939), pp. 229–232*).—"On a phosphorus-deficient acid soil progressively heavier phosphate applications up to 150 lb. of monocalcium phosphate per 2,000,000 lb. of soil gave increasingly marked plant response and phosphorus absorption. Small applications of lime resulted in decreased plant growth, decreased phosphorus absorption, and less economical water utilization as compared to unlimed soil. Larger applications reversed this behavior. Since this work was carried out on one

soil only, work of both more intensive and extensive nature is desirable. Phosphorus absorption by plants in this experiment is in accord with phosphorus solubility curves published by Perkins, Benne, and King, up to a pH value of approximately 7.00."

**Growth responses of Biloxi soybeans to variation in relative concentrations of phosphate and nitrate in the nutrient solution,** C. L. Hamner (*Bot. Gaz., 101 (1940), No. 3, pp. 637–649, figs. 4*).—Experimental results from many nutrient tests have indicated that, in general, if an element is lacking or low in the nutrient or soil solution it will be lacking or low in the plant, and several investigators have shown that a fairly definite relation exists in plants between their P and N contents and the type of growth or stage of development at the time of taking samples for chemical analysis. The present study has further demonstrated that such a relation between N and P in the nutrient solution also affects the growth rate of the plants and the appearance or lack of appearance of certain toxic symptoms. The relationship between P and N in soybeans was found to be important in overcoming P toxicity. When N was lacking, P was very toxic in very small concentrations, but with larger amounts of N present it was not toxic even in fairly high concentrations. In general, one part of $NO_3$ overcame the toxic effects of two parts of $PO_4$. In older plants this ratio may not be the same, seedlings being more susceptible, possibly due to a greater absorption of P in the seedling stage, a lower tolerance for it, or to the amount of P stored in the seeds. It is also possible that the older plants have enough stored N to tolerate an outside ratio which under other conditions would be toxic.

**A radioactive isotope study of the absorption of phosphorus and sodium by corn seedlings,** A. K. Brewer and A. Bramley. (U. S. D. A.). (*Science, 91 (1940), No. 2359, pp. 269, 270, figs. 3*).—The artificial radioactive method was used in a quantitative study of the absorption of P and Na by corn seedlings, and the simple technic used is described. The distribution of P in the plant changed appreciably with time, but the final distribution was, in general, quite uniform between the leaves as well as along each leaf except at the tip, which remained low. For both Na and P the rate and equilibrium values were the same for intact roots, for plants with roots excised at different positions, and for leaves removed at the base. Plants stunted in their early growth by dietary deficiency took up very little Na or P. Absorption was very low while plants were in darkness but increased rapidly on exposure to light. Low temperatures and a $CO_2$ atmosphere decreased the intake. Elimination of P and Na from the plant is also discussed.

**Absorption and movement of radiophosphorus in bean seedlings,** O. Biddulph (*Plant. Physiol., 15 (1940), No. 1, pp. 131–136*).—The movement of radiophosphorus was traced throughout the bean plant (Red Mexican variety), the total P associated with the roots proving twice as great as the concentration in the nutrient solution before appreciable amounts entered the aerial parts. The quantity of water-soluble P in the roots at the end of a 4-hr. period equaled that in the nutrient solution. The movement was rapid, following the transpiration stream, and accumulation was greatest in the leaves. An explanation of movement and accumulation is offered, as well as a critique of the work of Hevesy, Linderstrøm-Lang, and Olsen (E. S. R., 76, p. 313).

**The role of potassium in plants.—II, Effect of varying amounts of potassium on the growth status and metabolism of tomato plants,** M. E. Wall. (N. J. Expt. Stas.). (*Soil Sci., 49 (1940), No. 4, pp. 315–331, figs. 4*).—Continuing these studies (E. S. R., 81, p. 185) with Rutgers tomatoes grown at 0, 2.5, 5, 11, 22, 45, and 175 p. p. m. of potassium, respectively, all except the last

two series exhibited some degree of K deficiency, the severity being roughly proportional to decrease in the supply. The growth curves showed a rapid increase with increments of K supply until 45 p. p. m. was attained, above this point the growth curves slowly declining. Two symptom types were observed. The first stage appeared early and was marked by a stunted, hard, yellow plant. In the second stage the plants began to grow, turned green, and became soft, at the same time the lower leaves dying progressively upward on the stem. The first stage was associated with a high carbohydrate content in the low-K plants, while in the second stage the carbohydrates were greatly diminished. The K-deficient plants were characterized by a much higher soluble organic N content than those in the complete nutrient solutions. The initial carbohydrate accumulation and final decrease and the high soluble organic N were most noticeable in plants without K. As the supply was increased the plants approached progressively closer to normal in both N and carbohydrate, whereas their K content slowly increased with increasing K up to 22 p. p. m., after which increments of 45 and 175 p. p. m. caused sharp increases in K content. The concentrations of Ca, Mg, and of phosphates were generally higher in the low-K plants. There are 16 references.

**Potassium deficiency in ammonium- and nitrate-fed tomato plants,** M. E. WALL and V. A. TIEDJENS. (N. J. Expt. Stas.). (*Science, 91 (1940), No. 2357, pp. 221, 222, fig. 1*).—With K lacking, very different symptoms developed in plants supplied with nitrate v. ammonium nitrogen. In the latter case the comparatively high concentration of $NH_4$ nitrogen was apparently responsible for the much more rapid deterioration and collapse of the leaf tissue noted. The chemical reactions involved in the two cases are believed to differ only in the fact that the $NH_4$ plants had at hand a large supply of readily assimilated N, whereas the nitrate plants had first to form $NH_3$ through the reduction of nitrates.

**The influence of magnesium deficiency, chlorophyll concentration, and heat treatments on the rate of photosynthesis of Chlorella,** S. R. KENNEDY, JR. (Cornell Univ.). (*Amer. Jour. Bot., 27 (1940), No. 2, pp. 68–73, figs. 3*).—It was confirmed that, when chlorophyll concentration is varied by control of Mg concentration, an increase in chlorophyll does not at first cause a corresponding rise in photosynthetic rate such as would occur if the chlorophyll concentration were varied in other ways. Under flashing light, with length of dark period varied, the photosynthesis per flash per gram of chlorophyll is immensely augmented by increasing the time under dark period in cells rendered chlorotic by growth in Mg-deficient media. No corresponding increase was noted in Fe-deficient cells or in cells grown in full nutrient media. Thus Mg deficiency is associated with a lowering of the Blackman reaction rate.

In other tests the effect of heat treatments prior to measuring the photosynthetic rate at normal temperature was studied. No very prominent effect was noted at 40° C. within the time limit of the treatment, but at 45° a decided reduction in photosynthetic rate was observed which could not be explained by death of the cells alone. Using flashing light, it was shown that this heat inactivation must be concerned wholly or at least in part with something in the photosynthetic mechanism not involved in the Blackman reaction.

**Interrelation of light and darkness in photoperiodic induction,** K. C. HAMNER (*Bot. Gaz., 101 (1940), No. 3, pp. 658–687, figs. 5*).—The experimental evidence presented is believed to indicate that in both soybean and *Xanthium* photoperiodic induction depends in part on responses resulting from light exposure and in part also on responses resulting from exposure to darkness,

though only after periods of darkness exceeding a certain minimum length. Referring to the changes or conditions related to exposure to light as A and to those owing to darkness as B, and the resultant changes related to A and B as C, the establishment of the categories A, B→C as here suggested is an aid toward an interpretation of the behavior of *Xanthium* and soybean, and its extension to the interpretation of the photoperiodic behavior of other plants may be possible.

**Fluorescent lamps as a source of light for growing plants,** A. W. NAYLOR and G. GERNER (*Bot. Gaz., 101 (1940), No. 3, pp. 715, 716, fig. 1*).—Under fluorescent lamps, cabbage, cocklebur, corn, kidney bean, Biloxi soybean, tobacco, and tomato appeared, in general, more like plants grown in summer sunlight than did those grown under winter daylight alone or supplemented by incandescent filament lamps.

**A specimen-envelope folder,** C. O. SMITH. (Calif. Citrus Expt. Sta.). (*Phytopathology, 30 (1940), No. 3, pp. 278–280, figs. 2*).—The mechanical device giving uniformity of envelope here illustrated and described is made up of a firm fiberboard on which eight guide blocks are nailed and consists of two iron plate folders. The width of one plate folder is identical with that of the envelope, while the width of the second plate folder equals the length of the envelope. The guide blocks may be made from the rounded ends of 12-in. pot labels, and the length of the block varies with size of envelope.

## GENETICS

**[Seventh International Congress of Genetics]** (*Nature [London], 144 (1939), Nos. 3646, pp. 496–498; 3654, pp. 813–824*).—A general account by F. A. E. Crew and summaries of the activities of the various sections are presented.

**[Reports from the Genetics Congress]** (*Jour. Hered., 30 (1939), No. 9, pp. 371–374; 31 (1940), No. 3, pp. 129–132*).—Included are a report of the mouse geneticists by H. Grüneberg and an account of the papers presented and impressions gained from the Congress by R. A. Emerson and F. A. E. Crew (see also above).

**Relation between carotenoid content and number of genes per cell in diploid and tetraploid corn,** L. F. RANDOLPH and D. B. HAND. (U. S. D. A. and Cornell Univ.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 1, pp. 51–64, pls. 2, figs. 4*).—The doubling of the number of chromosomes in pure yellow corn, induced by heat treatment technic (E. S. R., 69, p. 40), resulted in a 40-percent increase in the content of carotenoid pigment and an approximate proportional increase in the active provitamin A fraction, including β-carotene and cryptoxanthin. The volume of the endosperm cells of the tetraploid was about 3.6 times the volume of comparable cells in the diploid. Increases in cell volume and carotenoid content of the tetraploid yellow corn resulted in a fivefold increase in the amount of carotenoid per endosperm cell. There was 2.5 times as much carotenoid per gene elaborated in the individual cells of the tetraploid as in the diploid, although a greater concentration of genes per unit volume was present in the diploid.

Carotenoid content varied widely among different commercial varieties, inbred strains, and hybrids of ordinary diploid yellow corn. An inbred line with the highest carotenoid content had more than four times as much carotenoid as the line lowest in this respect. Yellow appearance of the kernel was not a reliable criterion of carotenoid content.

In white corn doubling the chromosome number decreased carotenoid content 19 percent, and there was no cumulative gene action with respect to carotenoid content.

**The segregation of genes affecting yield of grain in maize,** M. T. Jenkins. (U. S. D. A. and Ohio State Univ.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 1, pp. 55–63, fig. 1*).—Segregation of genes affecting yield of grain in corn, as reflected in differences among individual plants to impart high average yield to their hybrid progeny, was determined in the first selfed generation of 7 plants of Krug corn. These differences were measured by testing top crosses between individual plants and the parent variety. The mean yield of all top crosses in the experiment was 62.7 bu. The average standard deviation among the top crosses of individual plants within the 7 $S_1$ populations was 2.8 bu. per acre, indicating only 1 chance in 40 of obtaining a plant within this generation whose top cross would yield 5.6 bu., or 8.9 percent, above the mean for the line. The limited segregation for yield prepotency appeared to permit and to emphasize the importance of early testing of lines to determine their relative endowment in factors affecting yield. A breeding method involving the production of synthetic varieties among short-time inbred lines is suggested for areas where hybrid corn may not be economically feasible.

**Note on the origin of the potato,** H. G. MacMillan. (U. S. D. A.). (*Gartenbauwissenschaft, 14 (1940), No. 2, pp. 308–325, figs. 2*).—From this critical review (83 references) of the physical background of South America, the tenancy of man (including the Indian name for the potato and exchange of seeds), and the various kinds of evidence for the origin of the potato, including photoperiodic studies, it is concluded that its source is still unknown. However, various theories are discussed, and lines for further investigation are suggested.

**White-flower character from X-ray treatment of tomato seed,** P. A. Young. (Tex. Expt. Sta.). (*Jour. Hered., 31 (1940), No. 2, pp. 78, 79*).—White-flowered tomatoes were first observed in 1938. The character presumably originated by mutation stimulated by X-ray treatment of the ancestor Marglobe tomato seed. The yellow-flower character (*Y*) is dominant over the recessive white-flower character (*y*). These characters segregated in a 3:1 Mendelian ratio. White-flowered plants apparently are homozygous recessive for white flowers and bred true through two generations tested. The white-flower character promises to be a valuable marker for disease-resistant selections.

**Chemical induction of genetic changes in Aspergilli,** R. A. Steinberg and C. Thom. (U. S. D. A.). (*Jour. Hered., 31 (1940), No. 2, pp. 61–63*).—Following a preliminary report (E. S. R., 82, p. 25) on the ability of mannitol- and $NaNO_2$-containing nutrient solutions to induce mutant formation in *Aspergillus niger* and *A. amstelodami*, the authors here present further data on these and six other *Aspergillus* species. It is noted that the mutants obtained were of quite the same type as those before reported, viz, "injury" mutants exhibiting a loss to varying degrees of the power to differentiate. Special cases are mentioned. All mutants induced by nitrite exhibited a decrease in sexual reproduction. Genetic variants formed with the addition of other compounds supplementing the action of nitrite were, in general, quite similar to those with nitrite alone. It is estimated that at least 50 percent of the trials with nitrite treatment should produce mutants. The constitution of the carbon source would seem to influence though not determine the production of mutants with nitrite. Tests with compounds other than nitrite that are known to be capable of eliminating amino N from amino acids and proteins appeared to indicate that the basis of their action was identical with that of nitrite, and that it consists in the elimination of amino N from protein. Moreover, no mutants were obtained with many organic compounds chemically without action on amino N. The significance and possible applications of the findings are discussed briefly.

**Genetic studies of resistance to alfalfa mosaic virus and of stringiness in Phaseolus vulgaris**, B. L. WADE and W. J. ZAUMEYER. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 2, pp. 127–134*).—In a cross of strains of Corbett Refugee with Great Northern and reciprocal, inheritance of resistance to alfalfa mosaic virus 1 and stringiness of pods were studied, genetic observations being made in $F_2$ and $F_3$ for both characters. From over 400 $F_2$ plants and over 300 $F_3$ families it was concluded that resistance is due in this case to duplicate dominant genes giving a ratio of 15 resistant to 1 susceptible in $F_2$ and of 7 resistant to 4 segregating 3:1, to 4 segregating 15:1, to 1 susceptible families in $F_3$. In the virus study the same plants were classified for stringiness, except that frost destroyed a part before they could be classified. Stringiness in this cross was due to duplicate recessive genes in which the dominant allels were complementary. Satisfactory fits to a ratio of 9 stringless to 7 stringy were found in $F_2$, and to a ratio of 1 stringless family, to 4 segregating 3 stringless to 1 stringy, to 4 segregating 9 stringless to 7 stringy, to 7 stringy in $F_3$. No linkage or association was noted between stringlessness and resistance to this mosaic virus.

[**Papers on animal genetics, physiology of reproduction, and lactation**] (*Amer. Soc. Anim. Prod. Proc., 32 (1939), pp. 18–43, 81–85, 161–163, 208–254, 333–375, figs. 8*).—Brief reports were presented on the following subjects before the American Society of Animal Production (E. S. R., 81, p. 496): Genetic Principles Governing the Rate of Progress of Livestock Breeding, by S. Wright (pp. 18–26); How Much Do We Really Know About Selective Breeding? by H. D. Goodale (p. 26); Breeding for Adaptability to Local Conditions, With Special Reference to Sheep on the Navajo Indian Reservation, by J. M. Cooper (pp. 26–32) (U. S. D. A.); Things the Livestock Registry Associations Are Doing or Might Do To Improve the Present Merit of Their Breeds, by E. M. Harsch (pp. 33–37); Suggestions on Breeding Investigations, by B. R. Evans (pp. 37–40); Topics Which Received the Most Attention at the Tierzucht Congress, Zurich, Switzerland, 1939, by D. W. Williams (pp. 41–43) (Tex. A. and M. Col.); Stallion Semen Studies at Michigan State College, by G. K. Davis and C. L. Cole (pp. 81–85) (Mich. Expt. Sta.); The Dam-Daughter Correlation of Clean Wool Production in Rambouillet Sheep, by H. M. Briggs (pp. 161–163) (Okla. Sta.); Conference on Artificial Insemination, by J. C. Miller and G. W. Salisbury (pp. 208–213) (La. State and Cornell Univs.); Methods for Semen Evaluation—I, Density, Respiration, Glycolysis of Semen, by R. E. Comstock and W. W. Green (pp. 213–216), and II, Sperm Cytology in Relation to Viability, by W. W. Green and R. E. Comstock (pp. 217–219) (both Minn. Sta.); Preservation of Spermatozoa, by H. A. Lardy and P. H. Phillips (pp. 219–221) (Univ. Wis.); The Storage of Horse and Swine Semen, by F. F. McKenzie, J. F. Lasley, and R. W. Phillips (pp. 222–225) (Mo. and Mont. Stas. and U. S. D. A.); The Effects of Feed on Sperm Production of Jacks and Stallions, and Some Physiological Properties of Their Semen, by V. R. Berliner, F. E. Cowart, and L. L. Pharis (pp. 225–231) (Miss. Sta.); Evaluating Bovine Semen—I, Influence of the Number of Ejaculates Upon Various Physical and Chemical Characteristics and the Relationship Between Those Factors, by H. P. Davis and N. K. Williams (pp. 232–242) (Nebr. Sta.); Lessons Learned From Eighteen Months' Experience With Cooperative Artificial Breeding of Dairy Cattle in New Jersey, by J. W. Bartlett and E. J. Perry (pp. 243–245) (N. J. Stas.); Some Factors Affecting the Efficiency of Artificial Insemination of Dairy Cows, by H. A. Herman (pp. 245–250) (Univ. Mo.); Characteristics of Ram Semen as Influenced by the Method of Collection, by D. E. Brady and E. M. Gildow (pp. 250–254) (Idaho Sta.); Selection of Range Rambouillet Ewes, by C. E. Terrill (pp. 333–

340) (U. S. D. A.); Gonadotropic Activity of Pituitaries From Cows in Different Stages of Pregnancy, by A. Nalbandov and C. E. Casida (pp. 340, 341) (Univ. Wis.); A Record of Performance for Sheep, by R. J. Christgau (pp. 342–347) (Univ. Minn.); The Occurrence of Estrus in Sheep and Its Relation to Extra-Seasonal Production of Lambs, by R. G. Schott, R. W. Phillips, and D. A. Spencer (pp. 347–353) (U. S. D. A.); The Mammary Growth Hormone of the Anterior Pituitary, by A. A. Lewis and C. W. Turner (pp. 354–357) (Mo. Sta.); The Reproductive History of the Stud at the United States Morgan Horse Farm From 1928 to 1938, by W. V. Lambert, S. R. Speelman, and R. W. Phillips (pp. 358–365) (U. S. D. A.); The Estrual Cycle of the Mare—A Preliminary Report, by F. N. Andrews and F. F. McKenzie (pp. 365–369) (Mo. and Mont. Stas. and U. S. D. A.); and Reproduction in Range Sheep, by C. E. Terrill and J. A. Stoehr (pp. 369–375) (U. S. D. A.).

**"Nicking" in dairy cattle**, D. M. Seath and J. L. Lush. (Iowa Expt. Sta. coop. Kans. State Col.). (*Jour. Dairy Sci., 23 (1940), No. 2, pp. 103–113*).—Study was made of the evidence of nicking by an analysis of variance in the milk production and fat percentage among daughters of 13 bulls. The analyses were based on a comparison of dam-daughter records in 13 Kansas Dairy Herd Improvement Association sires. The data from these bulls, when grouped according to their maternal grandsires, gave no indication that nicking was generally important in proving sires. Differences between groups could have been due to chance variation in the sample of inheritance transmitted by the bull or in the effects of different environments when the records were made.

**A genetic history of Hampshire sheep**, R. C. Carter. (Iowa Expt. Sta.). (*Jour. Hered., 31 (1940), No. 2, pp. 89–93, figs. 4*).—Employing methods recently used in breed studies of Poland China swine by Lush and Anderson (E. S. R., 82, p. 170), the author found that inter se relationship and inbreeding coefficients were calculated for samples of the animals born in the Hampshire breed in 1925 and 1935. About 0.7 to 0.9 percent of the existing heterozygosis was lost per generation during the period of study as judged by the inbreeding. The average inter se relationship's increasing only about 0.5 percent per generation with this amount of inbreeding suggested some separation into families.

**The genetics of coat color in horses**, W. E. Castle (*Jour. Hered., 31 (1940), No. 3, pp. 127, 128*).—Differences in the interpretation of Gremmel (E. S. R., 82, p. 465) involving three principal color genes determining coat color in horses are noted. Based on the analyses of others, an alternative explanation involving four principal genes is offered. These are (1) a wild pattern gene, (2) black-brown allels, (3) a color gene, and (4) an extension gene. At least two of these are in multiple allelic series.

**Inheritance of position preference in coach dogs**, C. E. Keeler and H. C. Trimble (*Jour. Hered., 31 (1940), No. 2, pp. 50–54, figs. 3*).—Data are presented to show that Dalmatian dogs possess characteristic differences as regards the positions which they take in running under carriages. These positions vary from touching the horses' heels to taking the position at the rear of the coach. Preference as to the position was not altered by training and seemed to be inherited in 20 matings. Matings of parents in which both adopted a running position under the front axle produced 24 dogs with a forward running position and 3 dogs taking a position near the rear axle. Dogs running further back produced more dogs running in this position.

**An inherited jaw anomaly in long-haired dachshunds**, H. Grüneberg and A. J. Lea (*Jour. Genet., 39 (1940), No. 2, pp. 285–296, pl. 1, figs. 6*).—A condition involving an undershot lower jaw with apparent lengthening of the upper jaw of long-haired dachshunds is described. The anomaly occurred in 16

dogs and 4 bitches, with which there were 27 normal dogs and 27 normal bitches. A simple Mendelian recessive gene seems responsible.

**Investigation of the physiological genetics of hair and skin color in the guinea pig by means of the dopa reaction,** W. L. RUSSELL (*Genetics, 24 (1939), No. 5, pp. 645–667, fig. 1*).—Studies were made of the enzymes present in the skin and hair bulbs of guinea pigs of different genotypes described by Wright (E. S. R., 61, p. 218). Variations in the dopa reaction in the natural yellow pigment were found to result from differences in the concentration or activity of the enzymes present as a result of gene replacement in the *C* and *F* loci. Effects of the lower allels in the albino series and *p* evidently resulted from changes in the concentration or activity of the enzyme. Differences in the responses of the genotypes in the hair and skin were noted, as well as the failure of the enzyme from the white portion of the coats of *ss* animals.

**A colorimetric study of genic effect on guinea-pig coat color,** G. HEIDENTHAL (*Genetics, 25 (1940), No. 2, pp. 197–214, figs. 2*).—Continuing studies on the quantitative aspects of coat color in the guinea pig by Russell (E. S. R., 82, p. 611), further observations on the yellow series confirmed and extended previous findings. A colorimetric method for the sepia genotypes closely paralleled Russell's findings by potassium permanganate titration. Considerable fluctuation in variability was found, although the total experimental error for the yellow series was 4.2 percent and for the sepia series it was 2.8 percent. Colorimetric determinations indicated the dominance of the allels in the yellow and sepia series and the order of different phenotypes. Factors possibly influencing the variability included the nonisogeneity of the hereditary background, environmental agents, and genetic factors for variability.

**Inheritance of internal organ differences in guinea pigs,** H. H. STRANDSKOV (*Genetics, 24 (1939), No. 5, pp. 722–727, fig. 1*).—Data are presented on the weights and measurements of the body and internal organs of 20 adult ♀♀ and 20 ♂♂ from 2 families of guinea pigs inbred for 24 and 31 generations by brother × sister matings and noted by Wright (E. S. R., 48, p. 263). Significant differences between the families were found.

**On the relation between birth weight and litter size in mice,** W. J. CROZIER (*Jour. Gen. Physiol., 23 (1940), No. 3, pp. 309–320, figs. 7*).—An analysis is presented of the relation of the mean weight of litters of different sizes showing the expression $W=aN^K$, in which $W$ is the mean weight in litters of $N$ size and $a$ is the ideal weight in a litter of one. The constant, $K$, is nonspecific and in adequately homogeneous stocks is 0.83. The studies were made of the progeny produced in an albino strain and an anemic strain carrying a recessive lethal and $F_1$s from normal dams. The weights of the $F_1$s were intermediate. Comparative mean weights in mixed litters produced in backcrosses and $F_2$s showed curious relations, especially in that anemic and heterozygous young in mixed litters increased in weight more for an increment of one in the litter than in unmixed litters of the same size.

**The inheritance of taillessness (anury) in the house mouse.—III, Taillessness in the balanced lethal line 19,** L. C. DUNN (*Genetics, 24 (1939), No. 5, pp. 728–731*).—Continuing this series (E. S. R., 82, p. 82), the author found a line of tailless mice to be heterozygous for the same or a similar lethal to line 29 (E. S. R., 78, p. 610). The allel for taillessness was normally transmitted by ♀♀ but in clusters of gametes by ♂♂. The balanced lethal condition resulted in true-breeding strains with reduced litter size.

**Linkage data on the rex character in the house mouse,** F. A. E. CREW and C. AUERBACH (*Jour. Genet., 39 (1940), No. 2, pp. 225–227*).—Linkage data showed no significant departures from a 1:1:1:1 ratio among the progeny

of the backcrosses of heterozygotes for the dominant gene Rex and the recessive genes for albinism, nonagouti, blue dilution, brown, and pink dilution to the homozygous recessive. Backcross data with a multiple recessive stock involving wavy-1, nonagouti, waltzing, leaden, and piebald showed that these genes were likewise not linked with the rex gene.

**The linkage relations of a new lethal gene in the rat (Rattus norvegicus)**, H. GRÜNEBERG (*Genetics, 24 (1939), No. 5, pp. 732–746*).—Linkage relations are discussed between the lethal gene in the rat which kills homozygotes between birth and about 5 weeks of age (E. S. R., 79, p. 464). This gene has been previously reported as linked to pink-eye dilution in the albino chromosome, and data are reported on the 5 pairs of genes which have been identified in this group, as follows: Normal and lethal; fully colored, ruby-eyed, and true albino; fully colored and red-eyed yellow; fully colored and pink-eyed yellow; and normal and waltzer. A cross-over percentage of 20.26±2.07 was found between the genes *p* and *l* in over 500 individuals, making the cross-over percentage for the *l-c* section of the chromosome 10.66 and the most likely locus for the lethal 3.3 units to the left of *c*. An analysis of the linkage data in the rat is summarized in the appendix of this article by J. B. S. Haldane.

**The pathology of the lungs in a lethal mutation in the rat (Rattus norvegicus)**, S. ENGEL and H. GRÜNEBERG (*Jour. Genet., 39 (1940), No. 2, pp. 343–349, figs. 4*).—A description of the lung condition in the lethal rat (see above) showed that the lung resembles the development of an inherited macrocytic anemia in the mouse (E. S. R., 82, p. 465). The lung structure corresponds to that of an earlier developmental stage of the normal rat. The primary action of the gene arresting lung development is on the cartilage which produced rigidness and narrowness of the thorax.

**Genetic studies in poultry.—X, Linkage data for the sex chromosome**, R. C. PUNNETT (*Jour. Genet., 39 (1940), No. 2, pp. 335–342*).—Further study (E. S. R., 70, p. 319) was made of sex-linked genes in the fowl. As a result of single and double cross-overs between the five genes in this chromosome, the order was placed as *Ko, B, Id, Br, Li, S, and K*. Double cross-overs suggested the possibility that the sex chromosome of fowls is more likely a long one than V-shaped. Data of other authors regarding the crossing over between genes in the sex chromosome are summarized.

**Individual blood differences in chickens**, W. C. BOYD and O. E. ALLEY (*Jour. Hered., 31 (1940), No. 3, pp. 135, 136*).—The rather general agglutination of samples of blood by serum samples suggested the presence of at least several antigenic factors. Individual blood differences were hereditary, and a character never appeared in the blood of a fowl unless present in the blood of at least one of its parents.

**[Genetics of the fowl, X].—A relation between breed characteristics and poor reproduction in White Wyandotte fowls**, F. B. HUTT. (Cornell Univ.). (*Amer. Nat., 74 (1940), No. 751, pp. 148–156, figs. 2*).—In continuation of this series (E. S. R., 82, p. 321), analysis of mortality records among about 15,000 eggs each from White Wyandottes, White Leghorns, and Rhode Island Reds produced on several farms for 7 yr. at official breeding stations in Lancashire, England, and in Northern Ireland showed that the percentage of White Wyandotte eggs hatched was about 12 percent less than the White Leghorns and Rhode Island Reds at one station and 4 and 8.2 percent, respectively, less than the breeds at the other station. Distinction was not made as to the role of fertility and lowered hatchability of fertile eggs, but the similarity of conditions for all breeds made evident the fact that White Wyandottes hatched fewer chicks per hundred eggs set than the other two breeds because of the

pleiotropic action of some gene or genes determining the characteristics of White Wyandottes or the linkage of deleterious genes with breed characters.

**On the identification of segregated phenotypes in progeny from creeper fowl matings,** D. RUDNICK and V. HAMBURGER. ([Conn.] Storrs Expt. Sta. et al.). (*Genetics, 25 (1940), No. 2, pp. 215–224, fig. 1*).—Attempts were made to separate the heterozygous and homozygous normals from matings of heterozygous creepers by somite counts after from 24 to 25 hr., from 32 to 44 hr., and from 48 to 50 hr. of incubation. Variability in somite counts showed that this did not furnish a satisfactory basis for distinction between homozygotes and heterozygous normals, although the lethals were on the average slightly less advanced in their somite development than their viable sibs. The mean somite numbers at from 24 to 25 hr. and from 32 to 44 hr. were 2.4 and 11.6, respectively, as contrasted with 3.7 and 13.8 for viable sibs. The first signs of pathological changes appeared in the lethals and their viable sibs at from 48 to 50 hr.

**A genetic analysis of species differences in Columbidae,** M. R. IRWIN. (Wis. Expt. Sta.). (*Genetics, 24 (1939), No. 5, pp. 709–721*).—Continuing these studies (E. S. R., 79, p. 613), the author found at least 10 specific Pearlneck characters, recognizable by immunological technics involving production by a rabbit of antisera to the species, to be isolated by backcrossing ringdove × Pearlneck hybrids to Pearlnecks. Data on separation of specific ringdove characters in the backcross generation are also included.

**[Studies on the physiology of reproduction and lactation by the Missouri Station],** F. F. MCKENZIE, F. N. ANDREWS, V. WARBRITTON, V. BERLINER, E. A. TROWBRIDGE, H. C. MOFFETT, C. W. TURNER, E. T. GOMEZ, A. J. BERGMAN, H. A. HERMAN, and W. R. GRAHAM (*Missouri Sta. Bul. 413 (1940), pp. 25–27, 38–40, 43, 44, 50*).—Brief reports are given on results of investigations along the following lines: Changes of the ovaries, vagina, and uterus, and time of breeding and sexual vigor in mares; sperm survival in different portions of the vagina and uterus and histological changes in the ovaries during corpus luteum formation in the ewe; a smear method of counting chromosomes in mammals; additional studies of hypophysectomy and replacement therapy in relation to the growth of the mammary gland of mammals (E. S. R., 77, p. 612); the role of hormones of the adrenal cortex in lactation in guinea pigs; the composition of rabbit milk stimulated by the lactogenic hormone; and injections of thyroxine in dairy cows during the declining stages of lactation.

**Reproduction in the spotted hyaena, Crocuta crocuta (Erxleben),** L. H. MATTHEWS (*Roy. Soc. London, Phil. Trans., Ser. B, 230 (1939), No. 565, pp. 78, pls. 14, figs. 36*).—Description is given of the morphology and histology of samples of the genitalia of ♂ and ♀ hyenas collected in the wild.

**Further studies on the parthenogenetic activation of rabbit eggs,** G. PINCUS and H. SHAPIRO (*Natl. Acad. Sci. Proc., 26 (1940), No. 3, pp. 163–165*).—Four does were operated upon for the installation of a cooling jacket which enclosed 3 cm. of the Fallopian tube shortly after ovulation was induced by a pituitary extract. Since other experiments in vitro (E. S. R., 82, p. 612) indicated cooling at 6° C. for from 10 to 30 min. to be the most effective, cooling in this manner for from 5 to 20 min. was tested in situ. One living ♀ rabbit was produced in this way.

**A note on abnormal shape of egg,** H. M. SCOTT. (Kans. Expt. Sta.). (*Amer. Nat., 74 (1940), No. 751, pp. 185–188, fig. 1*).—Although eggs held in the oviduct unusually long by substantial delay in laying were found to have shells heavier than normal, the percentages of shell determined in three such eggs did not depart from the normal. The shell percentages were reduced in abnormal eggs laid after those which had been held in the oviduct.

**A new type of bovine agnathia**, L. M. LALONDE (*Jour. Hered., 31 (1940), No. 2, pp. 80, 81, fig. 1*).—A case of agnathia in an Ayrshire calf is described from the Veterinary Hospital of Oka, LaTrappe, Quebec, Canada, and compared with other cases of a similar condition described in the literature, including that noted by Ely, Hull, and Morrison (E. S. R., 82, p. 31).

**Observations on the periodicity of oestrus in certain Australian Merino ewes and a half-bred group: Interim report upon the fertility of sheep**, R. B. KELLEY and H. E. B. SHAW (*Jour. Council Sci. and Indus. Res. [Austral.], 12 (1939), No. 1, pp. 18–22, figs. 4*).—Observations were made on the percentage of groups of Merino ewes and a group of Border Leicester × Merino ewes coming into oestrus from April to September, as determined by markings from voluntary matings with vasectomized rams. One group of Merino ewes was kept under constant observation from April 1936 to September 1938. A high percentage did not come into heat during the spring months from October to January. Although the spring and fall equinoxes were associated with equal amounts of daylight hours, the autumnal equinoxes were associated with full sexual activity, whereas there was little sexual activity in the spring. Differences in the intensity or equality of light are suggested as possible explanations.

**The oestrous cycle of the mare following removal of the foetus at various stages of pregnancy**, F. T. DAY (*Jour. Agr. Sci. [England], 29 (1939), No. 3, pp. 470–475*).—Following artificially induced abortion at from 51 to 105 days of gestation, the onset of oestrous varied from 5 to 25 days in five mares but did not occur in two. The duration of the oestrous period varied from 3 to 9 days. Ovulation occurred within 2 days of the end of the oestrous period. Irregularities of the cycle were noted in connection with the season.

**The effect of unilateral castration on spermatogenesis**, J. EDWARDS (*Roy. Soc. [London], Proc., Ser. B, 128 (1940), No. 852, pp. 407–421, figs. 2*).—A comparison of the semen production of four normal mature rabbits and of four comparable animals which had undergone unilateral castration gave evidence that there is no hypertrophy of spermatogenic function or of the weight of the testis following unilateral castration. A highly significant positive relationship was found to exist between the weight of testicular substances and the numbers of spermatozoa it produced.

**Cancer of the mammary gland in mice**, L. C. STRONG (*Jour. Hered., 31 (1940), No. 1, pp. 9–12, fig. 1*).—A presentation is made of the occurrence of spontaneous cancer in the CBA strain of mice, previously described (E. S. R., 65, p. 217), when subjected to different diets. On one diet less than 5 percent of the ♀♀ developed spontaneous tumors, whereas from 75 to 80 percent developed the condition on another diet. Evidently, the malignant tumor of the mammary gland in mice is determined by the reaction of the germ plasm to factors from the diet which were in operation before and after birth.

**A primer for mink breeders**, R. K. ENDERS (U. S. D. A. et al.). (*Amer. Fur Breeder, 12 (1940), No. 9, pp. 6, 8, fig. 1*).—A discussion is given on reproduction in fur animals and its application to breeding practices on fur farms, with particular reference to the mink.

**The "mule" pheasant—sex invert or intersex**, T. H. BISSONNETTE (*Jour. Hered., 31 (1940), No. 2, pp. 82–88, figs. 3*).—Two pheasants of the ♀ size showing both ♂ and ♀ plumage characters and which failed to lay are described, and sections of the sex organs were compared with a normal hen pheasant. The plumage was intermediate between normal ♂♂ and ♀♀. The left ovaries were without ova or follicles, and sex cords and tubules of the ♂ type were present in one with Sertoli-like cells.

**Anatomical and physiological changes in the pituitary glands of vitamin A deficient rats,** T. S. SUTTON and B. J. BRIEF (*Ohio Sta. Bul. 610 (1939), pp. 21, figs. 7*).—Cytological study of the anterior pituitary glands revealed marked increases in the β cells from vitamin A-deficient rats similar to the changes observed in castrate animals, although to a lesser extent. The gonadotropic activity of pituitary glands, however, was greater in the vitamin A-deficient animals, thus furnishing evidence that the deficiency exerts a direct damage to the gonads.

**A note on pituitary dwarfism in the mouse,** G. R. DE BEER and H. GRÜNEBERG (*Jour. Genet., 39 (1940), No. 2, pp. 297–300, figs. 2*).—Based on eight mice, the ratio of the weight at from 6 to 7 days of age to the birth weights was found to furnish a satisfactory means of differentiating pituitary dwarfs, previously described by Snell (E. S. R., 62, p. 323), from normals. The results were confirmed by a lack of eosinophile cells in the anterior lobe of the pituitaries of the supposed dwarfs.

**Electrophoretic study of pituitary lactogenic hormone,** C. H. LI, W. R. LYONS, and H. M. EVANS. (Univ. Calif.). (*Science, 90 (1939), No. 2348, pp. 622, 623, figs. 2*).—Electrophoretic studies of the lactogenic preparation suggest its purity.

**Essentiality of primary amino groups for specific activity of the lactogenic hormone,** C. H. LI, W. R. LYONS, M. E. SIMPSON, and H. M. EVANS. (Univ. Calif.). (*Science, 90 (1939), No. 2338, pp. 376, 377*).—Continuing these studies (E. S. R., 82, p. 323), the authors found the crop-gland stimulating activity of the pituitary hormone to be completely destroyed by nitrous acid as a result of 30 minutes' treatment, suggesting the essentiality of primary amino groups in the physiological activity of the hormone.

**Ovulation and the descent of the ovum in the Fallopian tube of the mare after treatment with gonadotrophic hormones,** F. T. DAY (*Jour. Agr. Sci. [England], 29 (1939), No. 3, pp. 459–469, pl. 1, fig. 1*).—Intravenous injection of nine mares with from 1,000 to 3,000 mouse or rat units of pregnancy-urine extract was found to induce ovulation in from 30 to 60 hr. if a sufficiently mature follicle was present in the ovary, but symptoms of oestrus did not occur. Injection of four mares during oestrus induced ovulation in from 22 to 30 hr. but reduced the duration of the heat period to 3 days, as contrasted with from 7 to 9 days in the normal. In one mare an ovum was recovered from the uterine end of the Fallopian tube 138 hr. after injection and 95 hr. after ovulation.

**The effect of thiol compounds on gonadotrophins,** H. L. FRAENKEL-CONRAT, M. E. SIMPSON, and H. M. EVANS. (Univ. Calif.). (*Science, 91 (1940), No. 2363, pp. 363–365*).—Thiol compounds, including cysteine, were found to decrease or destroy the potency of gonadotropic hormones from the pituitary, chorion, and pregnant-mare serum so far investigated.

**The antihormones,** J. B. COLLIP, H. SELYE, and D. L. THOMSON (*Biol. Rev. Cambridge Phil. Soc., 15 (1940), No. 1, pp. 1–34*).—A brief account is given of reports regarding the history and action of antihormones, especially the antigonadotropic and antithyrotropic hormones. There is still much confusion regarding the specificity of the action as regards species and the glands of origin.

**Artificial insemination,** B. L. WARWICK and R. O. BERRY. (Tex. Expt. Sta.). (*Southwest. Sheep and Goat Raiser, 10 (1940), No. 7, pp. 15–17*).—A description of methods of sperm collection and artificial insemination which have been used in practice and proved successful.

## FIELD CROPS

[**Farm crops research in Mississippi**] (*Miss. Farm Res.* [*Mississippi Sta.*], *3* (*1940*), *No. 3, pp. 1, 2, 3–6, 7, 8, figs. 8*).—Articles comprising brief reports of progress are entitled Maintain Improved Seedstock, by J. F. O'Kelly (pp. 1, 7); Lespedeza Shows Worth as Forage in Brown Loam Area, by H. W. Bennett (pp. 1, 8); Scant Increases Shown in Tests of Colloidal Phosphate, by R. Cowart (p. 2); Corn Varieties in Mississippi, by C. B. Owen (pp. 3–6); Cultural Methods for Buckshot Soils, by R. Kuykendall (p. 7); and Close Spacing Best Even Though Supply of [Sweetpotato] Plants Limited, by W. S. Anderson (p. 8).

[**Field crops experiments in Missouri**], W. C. Etheridge, B. M. King, L. J. Stadler, G. F. Sprague, J. G. O'Mara, E. R. Sears, L. Smith, J. M. Poehlman, E. M. Brown, C. A. Helm, T. J. Talbert, R. A. Schroeder, A. C. Ragsdale, and C. W. McIntyre (*Missouri Sta. Bul. 413* (*1940*), *pp. 57, 63–70, 82, 83, fig. 1*).—Further experimention (E. S. R., 78, p. 185) reviewed briefly included breeding work with corn, wheat, oats for immunity or resistance to smuts, barley, and soybeans; genetic studies with corn, chiefly on the production of genetic variations by radiation of pollen with ultraviolet rays; a genetic analysis of *Triticum monococcum*; variety trials with corn, wheat, barley, soybeans, oats, potatoes, sweetpotatoes, and cotton; treatments to break dormancy of spring-grown potatoes for fall planting; fertilizer tests with potatoes and sweetpotatoes; pasture research, including response of Kentucky bluegrass in growth and composition to soil temperature variations and moisture deficiency; influence of continuous rotation, and supplemented grazing on the density and productivity of bluegrass sod and live-weight gains made on pasture by beef cattle; a uniform drought- and heat-resistant $F_1$ of *Poa arachnifera* × *P. pratensis*; a comparison of rotation pastures with cultivated crops in the production of feed for cattle; and pasture records at the Hatch farm.

[**Field crops experiments in Washington**], O. E. Barbee, O. A. Vogel, E. F. Gaines, E. G. Schafer, W. A. Harvey, C. Seely, E. J. Kreizinger, W. Hermann, D. C. Smith, C. L. Vincent, W. J. Clore, H. D. Jacquot, H. P. Singleton, C. E. Nelson, C. A. Larson, F. L. Overley, and D. J. Crowley. (Partly coop. U. S. D. A. and Idaho Expt. Sta.). (*Washington Sta. Bul. 384* (*1939*), *pp. 12, 13, 14–17, 44, 45, 46, 70–73, 74–76, 79, 83, 85, 86*).—Research with field crops (E. S. R., 81, p. 201), reported on from the station and substations, comprised variety tests with spring and winter wheat and barley (E. S. R., 82, p. 476), oats, rye, corn (and hybrids), grain sorghum, millet, potatoes, seed flax, alfalfa, sweetclover, red clover, soybeans, grasses, and mixtures of forage crops; breeding work with corn, barley, rye, oats, wheat, sweetclover, potatoes, and forage grasses; observations on the effects of improper storage upon field stands of potato varieties; cultural (including planting) studies with wheat, flax (E. S. R., 81, p. 367), millet, Sudan grass, and crested wheatgrass; wheat as a nurse crop with crested wheatgrass; tillage and soil moisture studies; fertilizer tests with alfalfa and sugar beets, and with potatoes, corn, and wheat in rotation; crop rotations, including permanent fertility and organic matter maintenance studies; and control experiments with bindweed, quackgrass, and other perennials and weeds of cranberry bogs.

[**Field crops studies in Western Washington**], M. S. Grunder. (Partly coop. Wash. Expt. Sta. and U. S. D. A.). (*Western Washington Sta. Rpt. 1939, pp. 9–12*).—Brief reports are made again (E. S. R., 81, p. 363) from pasture studies on logged-off land; seedings of forage plants on burned-over land; variety tests with popcorn, soybeans for seed and green forage, and alfalfa; a trial of

flat pea; nurseries for oats-winter hardiness studies and for improvement of orchard grass; shed drying of hay by forced draft; and stack curing of hay with chimney ventilation.

**Vegetative composition and grazing capacity of a typical area of Nebraska sandhill range land,** A. L. Frolik and W. O. Shepherd (*Nebraska Sta. Res. Bul. 117 (1940), pp. 39, figs. 3*).—A vegetative survey of typical sand hill range in the eastern part of Cherry County during 1937, covering 114,759 acres, including the land of the Valentine Migratory Waterfowl Refuge, was conducted according to a modified combination of the ocular reconnaissance and the square-foot-density or point-observation-plat methods. Composition as to density and as to productivity and livestock carrying capacity were determined. The types identified were designated dune sand vegetation, dry valley or bunchgrass of dry meadows, wet phase of tall grass meadows, dry phase of tall grass meadows or transition type, and saltgrass or alkali meadows.

Decided changes in the composition of the vegetation of the sand hills during the past two or three decades were noted in a comparison of these results with reports of earlier investigators. *Andropogon scoparius* and *Stipa comata*, previously important species on the dune sand, materially decreased in abundance, and *A. hallii*, mentioned earlier as a dominant, has also apparently decreased. *Calamovilfa longifolia* probably increased somewhat. *Bouteloua hirsuta* and *Sporobolus cryptandrus*, deemed of minor importance by the earlier writers, increased considerably and rank second and third, respectively, in density, being surpassed only by *C. longifolia*.

Grasses contributing 2 percent or more to the entire area, with respect to vegetative density, are *C. longifolia* 14.8 percent, *B. hirsuta* 12.1, *S. cryptandrus* 11.8, *Panicum virgatum* 4.7, *A. scoparius* 4, *Spartina pectinata* 3.8, *Distichlis stricta* 3.7, *B. gracilis* 2.5, *A. furcatus* 2.3, and *A. hallii* 2.1 percent. Forbs and shrubs contributed 14.6 and 4.9 percent, respectively, to the total density. Grasses contributing 2 percent or more to the entire area in forage productivity were *C. longifolia* 26.1 percent, *Sporobolus cryptandrus* 16.4, *B. hirsuta* 6.4, *P. virgatum* 5.8, *A. furcatus* 4.9, *Spartina pectinata* 4.1, *A. scoparius* 4, *Carex* spp. 3.8, *Poa* spp. 3.4, *A. hallii* 3.1, *Sorghastrum nutans*, 2.4, and *D. stricta* 2 percent. Forbs and shrubs contributed 4.2 and 1.3 percent, respectively, to the total productivity. Plants poisonous to livestock were of no great importance.

**Even well-managed ranges are depleted by drought since 1931, experiments show,** E. W. Nelson and C. H. Wasser (*Colo. Farm Bul. [Colorado Sta.], 2 (1940), No. 2, pp. 3, 4*).—Examination of grass cover and its change and analysis of precipitation records show that grazing even when planned on a conservative or a deferred-rotation basis affects the better range forage plants in drought years. Improvement of depleted ranges may be accomplished only with the return of better precipitation years and by continuation of the better range management practices.

**Proper practices in planting alfalfa will aid in establishing good stand,** R. M. Weihing (*Colo. Farm. Bul. [Colorado Sta.], 2 (1940), No. 2, pp. 6–9, figs. 2*).—Practical suggestions are given on seedbed preparation, planting practices, fertilizers, and varieties of alfalfa (E. S. R., 81, p. 37) found satisfactory in Colorado.

**Hybrid corn tests indicate several kinds give increased yields where adapted,** W. H. Leonard and H. Fauber (*Colo. Farm Bul. [Colorado Sta.], 2 (1940), No. 2, pp. 12, 13*).—Tests during the period 1937–39 show that a number of hybrids (E. S. R., 82, p. 39) have outyielded by substantial percentages the standard Minnesota No. 13 at the station and Reid Yellow Dent (Moore Strain) at Rocky Ford. A tendency to plant hybrids materially later than standard adapted field varieties in a locality is discouraged.

**Hybrid corn,** H. B. Brown (*Louisiana Sta. Cir. 25* (*1940*), [*pp. 4*]).—A popular discussion of hybrid seed corn, its production, and commercial hybrid seed, with yield data from comparative tests of hybrids and open-pollinated varieties in southern Louisiana. As in tests in Corn Belt States, Louisiana tests have shown that locally developed hybrids outyield open-pollinated varieties by from 10 to 30 percent, and with good quality, especially in weevil resistance. However, success with hybrids may not be as great in Louisiana and elsewhere in the South, for on the average corn yields are much lower.

**Suggestions for increasing corn yields in central and south Louisiana,** H. B. Brown (*Louisiana Sta. Cir. 23* (*1940*), [*pp. 7*]).—Corn yields in the area, according to station experiments, may be improved by proper fertilization and soil improvement by summer or winter legumes, thorough seedbed preparation, use of such varieties as Tuxpan, Hill Yellow Dent, or Cocke or Hastings Prolific, planted from February 25 to May 15, 12 in. apart in 4-ft. rows on alluvial land or 2 ft. apart on bench land, and cultivation enough to keep down grass or weeds.

**Corn production in the alluvial section of Louisiana,** C. B. Haddon and D. M. Johns (*Louisiana Sta. Cir. 24* (*1940*), [*pp. 4*]).—Corn varieties, seedbed preparation and cultivation, date of planting, spacing, and fertilizers, based on tests at the Northeast Louisiana Substation, are recommended for alluvial soils in the State.

**Corn production on the hill lands of Louisiana,** S. Stewart (*Louisiana Sta. Cir. 26* (*1940*), [*pp. 3*]).—Production practices in growing corn, indicated by tests at the North Louisiana Substation, include planting in water furrows between March 15 and April 5, following winter legumes with cotton and growing corn after the cotton, top dressing 200 lb. of sodium nitrate when corn is knee high, and choice of the Hastings, Cocke, and Mosby (prolifics), Calhoun Red Cob, or Sentell White Dent varieties. Corn in 6-ft. rows with a summer legume between each row has made about the same yields, but with better quality, as in 4-ft. interplanted rows.

**Effects of inbreeding cotton with special reference to staple length and lint percentage,** L. M. Humphrey (*Arkansas Sta. Bul. 387* (*1940*), *pp. 16*, *figs. 8*).—Inbred lines were started in several cotton varieties in 1936 when the "inbreeding and hybridization" method was introduced into the cotton breeding and improvement program at the station, and the number of varieties was increased in 1937 and 1938. Varieties were found to be very nonuniform, particularly for fiber characteristics. A highly significant negative correlation between staple length and lint percentage was found in five varieties, and no significant correlation was found in others studied. Inbreeding cotton varieties rapidly segregated many types that became relatively uniform after from two to three generations, and the inbred lines were always much more uniform than the parent varieties. Comparison of 2- and 7-yr. inbreds indicates that little increase in uniformity occurs after 2 yr. of inbreeding.

**Results of cotton variety tests, 1936–1939,** U. R. Gore. (Partly coop. U. S. D. A.). (*Georgia Sta. Bul. 204* (*1940*), *pp. 31*, *figs. 4*).—Variety tests with cotton in four localities in each section of the State showed the leaders in money value per acre in north Georgia tests to include Stoneville 2B, Coker 100, and D. and P. L. 11A, and in the south Georgia tests Coker Clevewilt 7, Coker 4-in-1, Wannamaker Wilt Resistant Cleveland, and Stoneville 2B. During 4 yr. Stoneville 2B was the best cotton in all tests except where wilt was unusually severe and might profitably replace Stoneville 2A in one-variety communities. The best wilt-resistant varieties for south Georgia—Coker 4-in-1, Coker Clevewilt 7, and W. W. Wannamaker Wilt Resistant Cleveland—have a staple of from 1 to 1$\frac{1}{16}$ in. and good wilt resistance and differ very little in value for wilt lands. Stoneville 2B, well adapted to the nonwilt soils of south Georgia, has yielded

well and is recommended for Coastal Plain soils not heavily infested with *Fusarium* wilt. Clevewilt 7 appeared to be better than Clevewilt 6, which it might replace in one-variety communities in south Georgia. Rhyne Cook gave the best yields of the Cook strains tested. Cook 144–68 is earlier and gives an inch staple, but the bolls are small and it does not yield enough lint.

Important varieties are described and comments made on one-variety community production and on variables. While variety is the major factor influencing lint length, environment, location, and season affect the staple of all varieties to a certain extent. Boll size and ginning percentage likewise are affected by both variety and environment.

**Good varieties of cotton for Missouri**, B. M. King (*Missouri Sta. Cir. 206 (1940), pp. 8, fig. 1*).—Deltapine (D. P. L. 11A), Stoneville 2–B, and Ambassador (Stoneville 4–B), cotton varieties outstanding in tests at the Sikeston Experiment Field on Lintonia silt loam, are described, with remarks on their origin and adaptation to different levels of soil fertility. Causes of deterioration and ways to keep a variety pure are discussed, with an outline of other practices in producing good crops of cotton.

**1939 report, cotton variety tests in Oklahoma**, H. E. Dunlavy, I. M. Parrott, and F. W. Self. (Coop. U. S. D. A.). (*Oklahoma Sta. Cir. 87 (1940), pp. [3]+56*).—Results of 9 tests of cotton varieties and strains, conducted in 1939 in cooperation with farmers or institutions in different localities, are reported by individual tests and are summarized by areas. The average lint percentage, boll size, and staple length are shown for each of 23 varieties included in all tests. The data collected indicated that, in the eastern and central portions of the Oklahoma Cotton Belt, the Deltapine and Stoneville strains or types are perhaps the best producers of acceptable staple, Rowden types make a satisfactory showing, and the Half-and-Half types make good yields of lint cotton but with an unsatisfactory staple length. In southwestern Oklahoma the Mebane types are indicated to be rather outstanding in production and acceptable staple, with Acala 5 and Acala 8 types also making good showings. As in the eastern sections, the Half-and-Half types were good producers, but their staple lengths were perhaps too short for best market demand.

**Kudzu for erosion control in the Southeast**, R. Y. Bailey (*U. S. Dept. Agr., Farmers' Bul. 1840 (1939), pp. [2]+32, figs. 17*).—The characteristics of kudzu (E. S. R., 82, p. 765); its soil, climatic, and cultural requirements; utilization for hay and grazing; eradication; and insect pests and plant diseases are described, and information is given on the use of the crop for protection of cultivated land, banks, and fills, gully control, and in water-disposal systems.

**Peanut breeding and variety studies (a progress report)**, G. K. Middleton, P. H. Harvey, H. F. Robinson, and J. W. Farrior (*North Carolina Sta. Agron. Inform. Cir. 125 (1940), pp. [11]*).—Yield trials since 1931 showed that certain Virginia Bunch selections produced the higher yields in certain tests and Jumbo runner strains in others. A brief progress report is also given on different phases of the breeding program begun in 1938, including disease studies, plant selection, hybridization, dates of planting and of harvesting seed, seed inoculation with bacteria, fertilizer-variety tests, and plat technic.

**Vitamin $B_1$ and plant hormones [for rye]** (*Farm Res. [New York State Sta.], 6 (1940), No. 2, p. 7*).—Neither α-naphthylacetamide nor indolebutyric acid increased the grain weight of the seedlings of 15 seed stocks of winter rye under soil conditions at Geneva nor the number or vigor of seedlings in a greenhouse. A seed treatment designed to prevent smut proved more effective in producing more and larger plants.

**Sorghum in north Georgia,** T. S. Boggess and J. E. Bailey (*Georgia Sta. Cir. 121 (1940), pp. 20, figs. 12*).—Practical information, secured in experiments in cooperation with the U. S. Department of Agriculture and Tennessee Valley Authority in certain phases, is given on sorgo varieties (Blue Ribbon is currently the choice), cultural methods and field practices used in growing the crop, extracting and handling the grain, the sirup plant and its equipment, evaporation of juice, and canning the sirup.

***Tests show soybeans, at present price level, unprofitable on irrigated farms,*** D. W. Robertson, O. H. Coleman, and R. M. Weihing (*Colo. Farm. Bul. [Colorado Sta.], 2 (1940), No. 2, pp. 5, 6*).—Additional variety tests (E. S. R., 68, p. 40), 1937–38, indicate that the varieties Scioto, Minsoy, Habaro, Mukden, Dunfield, Mandell, Mandarin, Illini, Manchu, and Mansoy may be adapted to irrigated conditions similar to those found on the station at Fort Collins. Available yield data suggested that soybeans do not yield well enough to be recommended at the current price level to replace any other legume being grown generally on irrigated farms in Colorado.

**Inspection of agricultural seeds,** H. R. Kraybill et al. (Coop. U. S. D. A.). (*Indiana Sta. Cir. 252 (1939), pp. 121, fig. 1*).—The purity, germination, and weed seed contents, and for legumes the hard seed contents are tabulated from tests of 1,702 official samples of seed collected from dealers in Indiana during the year ended June 30, 1939.

**Summary of results of seed and legume inoculant inspection for 1939,** J. G. Fiske (*New Jersey Stas. Bul. 672 (1939), pp. 22*).—Seed dealers in New Jersey from whom 2,144 official samples of crop and vegetable seed and seed mixtures were collected in 1939 are listed with compliances and violations, and crops, inoculation, and number of organisms are shown for 41 official samples of legume inoculants.

**Spread of white-top seed in the droppings of grazing cattle,** R. S. Rosenfels (Coop. U. S. D. A.). (*Nevada Sta. Bul. 152 (1940), pp. 5, figs. 3*).—Observations near Fallon, Nev., supplemented by germination tests at Newlands Field Station, suggested that cow droppings containing seed of whitetop (*Lepidium draba, L. repens, Hymenophysa pubescens*) may spread the weeds far and wide. "The length of time during which cattle may spread living seeds in their droppings can be determined only by experimental tests. However, it is clear that before cattle are moved to clean fields it would be wise to hold them in quarantine for 10 days or more to permit them to get rid of most or all of the whitetop seeds which they have eaten."

## HORTICULTURE

**[Horticultural studies by the Missouri Station],** T. J. Talbert, A. E. Murneek, A. D. Hibbard, F. L. Wynd, S. Shaw, E. J. Gildehaus, G. E. Smith, P. H. Heinze, H. G. Swartwout, R. A. Schroeder, and C. G. Vinson (*Missouri Sta. Bul. 413 (1940), pp. 75–79, 81, 82, 83*).—Included are progress reports on the following studies: Varieties and propagation of nuts, embryo growth and development of the apple fruit, the relation of photoperiodic induction to photoperiodic inhibition, photoperiodism and enzyme activity, effects of photoperiod on respiration, the effects of temperature on the physiology of reproduction in beets, complete fertilization of apple trees, calcium cyanamide as a source of nitrogen for apple trees, decomposition of calcium cyanamide on the soil surface, the nutrition of Concord grapes, factors limiting the production of sweet cherries in Missouri, variety tests of vegetables, the relation of fertilizers high in potash to quality in vegetables, pollination of greenhouse tomatoes,

the growing of greenhouse cucumbers, variety and fertilizer tests with tomatoes, the testing of cabbage varieties for disease resistance and fertilizer needs, and varieties of cantaloups and watermelons.

[**Horticultural studies by the Washington Station**], K. Groves, H. Fallscheer, J. L. St. John, E. L. Overholser, O. M. Morris, F. L. Overley, A. L. Kenworthy, J. B. Moore, D. F. Allmendinger, C. D. Schwartze, W. J. Clore, G. A. Huber, C. L. Vincent, L. C. Wheeting, J. C. Snyder, S. E. Wadsworth, and D. J. Crowley. (Partly coop. U. S. D. A.). (*Washington Sta. Bul. 384 (1939), pp. 26, 27, 43, 44, 45, 46–49, 50–55, 76–79, 83, 84, 86*).—Among studies the progress of which is discussed are spray residue removal, the hexose sugars in ripening fruits, orchard cover crops, maturity studies with peaches, methods of propagating hardy apple stocks, relation of soil temperatures to winter injury in fruit trees, factors affecting the set of fruit in Washington orchards, spray injury, strawberry breeding, fertilizers for orchards, breeding raspberries for hardiness and disease resistance, orchard irrigation, fertilizer requirements of asparagus and other truck crops, orchard soil toxicity as related to the growing of small fruits and truck crops, selection and breeding of truck crops, varietal investigations with fruits, fruit storage and handling, factors related to bud abscission of gardenias, and the adaptation of ornamental perennials to eastern Washington.

Studies reported from the Irrigation Substation include tree and fruit responses from irrigation, varietal studies of fruits and truck crops, and fertilizer experiments with truck crops.

Among studies at the Cranberry-Blueberry Laboratory were frost control by sprinkling, irrigation observations, and blueberry culture.

[**Horticultural investigations by the Western Washington Station**], C. D. Schwartze, W. J. Clore, G. A. Huber, H. T. Campbell, H. C. Diehl, M. Boggs, and K. Baur. (Partly coop. Wash. Expt. Sta. and U. S. D. A.). (*Western Washington Sta. Rpt. 1939, pp. 25–35, 36, 37, 48, 49, 51*).—Among studies discussed are strawberry breeding; breeding raspberries for hardiness and disease resistance; breeding and variety testing of blackberries and dewberries; variety testing of blueberries, peaches, filberts, grapes, and miscellaneous fruits; rhubarb breeding and forcing; vegetable freezing; testing of peas, sweet corn, beans, tomatoes, and other vegetable varieties; spacing of lima beans; rates of seeding for peas; pea breeding; fertilizers for freezing peas and sweet corn; and the culture of lima beans and freezing peas on the Felida, Lauren, Sifton, and Puget soil series.

**Satisfactory varieties of vegetables for Colorado conditions are listed**, A. M. Binkley (*Colo. Farm Bul. [Colorado Sta.], 2 (1940), No. 2, pp. 10, 11*).—Stating that the growing seasons in Colorado vary between 82 and 186 days and that at high elevations only typically cool-season vegetables may be grown, the author presents lists of varieties which have shown promise in trials conducted by the station.

**Vegetables for the Panhandle area of Oklahoma**, H. J. Thomson (*[Oklahoma] Panhandle Bul. 65 (1940), pp. [4]+16, figs. 4*).—Based on results of trials extending over the period 1927–39, general information is presented on the behavior of varieties and on cultural requirements. Cool-season crops, such as cabbage, peas, and spinach, are said to be somewhat uncertain; but warm-season crops, such as melons, cucumbers, and okra, may be grown effectively, especially with irrigation. Tomatoes often failed to set or develop during the very hot weather of summer, but with selected varieties and irrigation have done fairly well. Tabulated data are presented on the yields of cucumbers, muskmelons, tomatoes, squashes, and pumpkins, all grown under irrigation.

**Effect of spacing and length of harvesting period on yields of asparagus,** E. S. Haber (*Iowa Sta. Bul. P6, n. ser.* (*1940*), *pp. 209–224, figs. 2*).—Cutting asparagus until July 15 each year shortened materially the profitable life of Mary Washington plantings. Cutting until July 1 for 10 yr. caused considerable reduction in yield after the sixth year, and the average weight of spears was reduced. Cutting until June 15 gave the greatest yields over the 10-yr. period. There was some reduction in average weight of the spears during the last 4 yr., but most of the spears were of good marketable quality. Cutting until May 1, May 15, or June 1 was less profitable than June 15 cessation. The average weight of spears was somewhat larger with the shorter cutting seasons, but total yields were not sufficient to justify discontinuing harvesting on these early dates.

As to spacing, plants set 1 ft. apart in the row produced smaller spears than those set 2 or 3 ft. A 3-ft. spacing lessened the total yield over a 9-yr. period, but the decrease was not highly significant. Under the conditions of the experiment, rows spaced 3 ft. apart were satisfactory when the distance between plants in the rows was greater than 1 ft. The harmful effects of too close spacing became more apparent as the plantings became older. The author discusses other cultural factors, such as fertilizers, soil pH, and weeding, which are also concerned in maintaining profitable production.

**Crown-grading experiments with asparagus,** H. A. Jones and G. C. Hanna (*California Sta. Bul. 633* (*1940*), *pp. 16*).—*Records taken over a 12-yr. period* on Palmetto and Mary Washington plants graded into 3 sizes at the time of setting in 1924 showed the superiority of large plants. The mean yield of Palmetto spears for the first 7 cutting seasons was significantly greater for *the largest crowns as compared with the smallest. In Mary Washington the* large and medium plants significantly outyielded the small over the 12 cutting seasons. During that period Mary Washington outyielded Palmetto. There was no significant difference between crown grades in the mean number of spears harvested per plant for Palmetto over the 12 yr. In Mary Washington, crown grades large and medium produced significantly more spears than did the small grade. Palmetto produced a mean of 5.3 more spears per plant than did Mary Washington, a highly significant difference, but the mean weight of Mary Washington spears was 5.2 gm. greater than those of Palmetto, also highly significant. There was no apparent relation between size of crowns and weight of spears. When spears were graded for size, a greater percentage by weight of Mary Washington than of Palmetto fell into the larger grades.

Subsequent to the close of the cutting season, Mary Washington produced a mean of 1.4 fewer stalks per plant than did Palmetto, the difference being significant.

**Bean varieties for commercial canning,** W. T. Tapley (*Farm Res.* [*New York State Sta.*], *6* (*1940*), *No. 2, pp. 10, 13*).—Records taken on non resident and mosaic-resistant Green Refugee beans showed comparative yields in favor of the resistant strains. There was a considerable variation in time of ripening, in spread of the picking season, and in the quality of the canned product.

**Tests of some new cabbage varieties in 1939,** A. E. Hutchins. (Minn. Expt. Sta.). (*Minn. Hort., 68* (*1940*), *No. 2, p. 28*).—Of 12 varieties of cabbage tested, Golden Acre ranked first in earliness and second in total yield. Its crop was harvested in two cuttings. Early Summer led in total yield but was next to latest in maturity.

**Work progressing on new cabbage strains,** O. A. Reinking and W. O. Gloyer (*Farm Res.* [*New York State Sta.*], *6* (*1940*), *No. 2, p. 11*).—Observations made on a number of yellows-resistant varieties and strains showed them

to vary considerably in their degree of resistance. Attempts to isolate high-yielding, adapted types for New York State have met with considerable success, and a selection known as Geneva Resistant Seneca is considered very promising for early market and kraut manufacture.

**Greenhouse fertilizer studies of celery**, L. F. OUNSWORTH (*Sci. Agr., 20 (1940), No. 6, pp. 329-343, figs. 6*).—In the case of celery grown in pure quartz sand supplied weekly with various nutrient solutions it was observed that a proper balance of N, P, and K is needed for the best growth. A 4-8-16 NPK formula used at the rate of 1 ton per acre gave the best results. A lack of N resulted in small, pale-green to yellowish plants of little value. A lack of P gave small plants of pale-green color and many leaves mottled with bronze. Without K the plants grew normally for 5 weeks, apparently on reserves, and then rather abruptly turned yellow and developed a weakened root system and poor growth.

In supplemental trials in muck and mineral soils with the same amounts of fertilizer, somewhat different results were secured which were apparently due to native nutrients in the soil. P was the limiting factor on muck soil in the greenhouse. The mineral soil apparently contained adequate N and K for good growth, since additions of these two elements decreased yields. An 8-percent application of P increased the size of plants.

**Development of the staminate and pistillate inflorescences of sweet corn**, O. T. BONNETT. (Ill. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 1, pp. 25-37, pls. 7, fig. 1*).—The developmental morphology of the tassel, the ear, and their parts was studied by dissecting them from the stem of the sweet corn plant (*Zea mays rugosa* Bonafous) at different stages of development. Photomicrographs were taken of the various stages. In the first stage of the development of the main shoot, leaves and axillary shoots are produced, and in the second stage the internodes of the stem elongate, and the tassel, ear, and their parts differentiate and develop. From the elongated growing point of the central axis, tassel differentiation begins with the appearance of lateral projections, branch initials, which arise acropetally. The basal branch initials on the main axis elongate into tassel branches of the first order, and branches of the second order arise as buds at the basal margins of branches of the first order. The branch initials above the basal ones give rise to spikelet initials. Differentiation of the ear begins with the elongation of the growing point of the topmost axillary shoot in single-eared types, followed by the appearance of lateral projections, which arise acropetally. There are no elongated basal branches in the normal ear. In both the tassel and ear the spikelet-forming branch initials divide into two unequal parts to produce spikelet initials, and the spikelet initials divide into two unequal parts to form the flower initials. In the tassel the spikelet developing from the larger division of the branch initial is pediceled, and the spikelet from the smaller division is sessile. In both ear and tassel the spikelet from the larger initial begins development of its parts ahead of the smaller initial, and the same is true for the larger and smaller flower initials in the ear and tassel. In those types of corn having only one fertile flower per spikelet, the larger flower initial becomes the fertile (upper) flower, and the smaller initial becomes the abortive (lower) flower. The empty glumes are the first spikelet parts to differentiate. Flower parts form in the following order: Lemma and palea, anthers, and pistil. In the pistil the order is ovary, silk, and hairs on the silk. The ear and tassel are indeterminate inflorescences.

**Sweet corn variety and canning trials**, R. G. ROTHGEB. (Univ. Md.). (*Canning Trade, 61 (1939), No. 40, p. 8*).—Brief information is presented on the results of tests in 1938 of 88 hybrids and 12 open-pollinated stocks grown in replicated trials at College Park, Md.

**"Starter" solutions for tomatoes,** C. B. Sayre (*Farm Res.* [*New York State Sta.*], *6* (*1940*), *No. 2*, *p. 12*).—Again discussing (E. S. R., 81, p. 213) the effect of placing a small quantity of nutrient solution about the roots of tomato plants at the time of setting in the field, the author reports an increase in yield of early tomatoes (harvested by August 31) of 1.45 tons per acre, as compared with plants receiving plain water at transplanting. Good results were also secured with cabbage, peppers, eggplants, and melons.

**Potassium deficiency in ammonium- and nitrate-fed tomato plants,** M. E. Wall and V. A. Tiedjens. (N. J. Expt. Stas.). (*Science*, *91* (*1940*), *No. 2357*, *pp. 221, 222*, *fig. 1*).—Tomato seedlings growing in white quartz sand were supplied with the following solutions: (1) Complete nutrients with nitrate nitrogen, (2) complete nutrients with ammonium nitrogen, (3) lacking potassium with nitrate nitrogen, and (4) lacking potassium with ammonium nitrogen. The plants of the first two lots grew luxuriantly throughout the experiment. After 3 weeks the plants in lot 3 exhibited early deficiency symptoms, that is, stunted growth, foliage containing abundant starch, and pin-point, necrotic areas on the curled margins of the older leaves. The plants in lot 4 exhibited the following symptoms on the seventh day: The foliage was darker green; the plants were stunted and contained considerable starch, which, however, disappeared rapidly after 4 days; the leaves wilted and died within 24 hr. after the appearance of the symptoms but without changing color or exhibiting any of the symptoms shown by lot 3; and the comparatively high concentration of ammonium nitrogen in the plants apparently was responsible for the rapid deterioration and collapse of the leaf tissues. The lack of potassium apparently prevented the ammonium nitrogen from being converted into amino and protein nitrogen. The plants in lot 3 formed ammonia through the reduction of nitrates, thus requiring more time before symptoms appeared.

**Spacing staked tomatoes,** J. J. Woods (*Sci. Agr.*, *20* (*1940*), *No. 6*, *pp. 313–316*).—In each of 4 yr. the highest total yields and the largest yields of early-ripe tomatoes from Bonny Best plants set in rows 3 ft. apart and spaced 12, 18, 24, and 30 in. in the rows were secured with the closest planting. The acre yields for the four spacings were computed as 63,646, 49,368, 44,044, and 33,389 lb., respectively. The yield of individual plants was greatest at the widest spacing, but not sufficiently so to offset the smaller number.

**A scoring system for canning tomatoes,** W. M. Fleming and F. E. Atkinson (*Sci. Agr.*, *20* (*1940*), *No. 6*, *pp. 317–320*).—Allowing 50 percent of the score for cultural qualities and 50 percent for canning qualities, the authors present a scoring system for use in trials of varieties and strains of tomatoes. Under cultural characters, yield, percentage of culls, size of fruits, shape, and cavity are given 14, 14, 10, 6, and 6 points, respectively. Under canning qualities, color, drained weight, number of whole fruits, total solids by refractometer, and flavor are the most important points.

**Analyses of materials sold as insecticides and fungicides during 1939,** C. S. Cathcart and R. L. Willis (*New Jersey Stas. Bul. 670* (*1939*), *pp. 16*).—There are presented in the usual manner (E. S. R., 80, p. 768) the results of the examination of materials collected during the inspection of 1939.

**Proper spraying a prerequisite to the production of quality peaches, apples, plums, pears, and grapes—here's how,** C. Lyle and T. E. Ashley (*Miss. Farm Res.* [*Mississippi Sta.*], *3* (*1940*), *No. 3*, *p. 7*).—Spray schedules are presented.

**Making mutant fruits by radiation,** B. R. Nebel (*Farm Res.* [*New York State Sta.*], *6* (*1940*), *No. 2*, *p. 11*, *fig. 1*).—This is a brief discussion of the technic and principles involved in the use of X-rays for inducing mutations in plants.

**Pollination of fruit trees: The present state of research and its application to fruit culture,** F. T. Bowman (*Jour. Austral. Inst. Agr. Sci., 5 (1939), No. 4, pp. 212–217*).—The specific fruits discussed are pears, apples, cherries, plums, and almonds.

**New practices to regulate the fruit crop,** A. E. Murneek (*Missouri Sta. Bul. 416 (1940), pp. 15, figs. 2*).—The removal of rings of bark from ⅛ to ¼ in. in width from the base of large branches resulted in increasing the percentage of flower clusters to mature fruits by 204.1, 94, 31.6, 278, and 258.8, respectively, in Black Twig, Rome Beauty, King David, Delicious, and Stayman Winesap apples. In the Winter Nelis and Duchesse d'Angouleme pears the increases were 57.4 and 36.1 percent. In the Royal Duke and Montmorency cherries there was an increase of 29.5 percent and a decrease of 5.3 percent, respectively. Peaches did not respond greatly, the figures for Eureka, Golden Elberta, and Early Crawford being 15.3, —3.5, and 8.8 percent. Despite the increased numbers, the fruits were larger on ringed branches, ripened earlier, and had a higher sugar content. Scoring, a treatment in which cuts were made without bark removal, gave promising results with Delicious and Stayman Winesap.

When used as a spray at a dilution of 0.0005 percent, naphthaleneacetic acid reduced the drops of Delicious from 66 to 28.6 percent and at 0.001 percent concentration from 66 to 9.7 percent. Naphthaleneacetamide at 0.001 percent concentration reduced Delicious drops from 66 to 2.2 percent. Positive results were also secured with the Winesap variety.

Creosote oil at 1.5 percent concentration was found effective in destroying apple blossoms in the late cluster-bud stage. Cresylic acid at 1.5 percent and tar oil at 3 percent were also effective. The use of these materials in breaking up the biennial bearing habit in varieties of apples is discussed. Procedures are suggested for each of the above practices which may be used as guides.

**Inducing fruit bud formation,** F. W. Hofmann. (Va. Expt. Sta.). (*Va. Fruit., 27 (1939), No. 9, pp. 14, 16, 17, fig. 1*).—Based on observations over a number of years, the conclusion is reached that the chances for fruit bud development are far better when there is an above-average amount of rainfall, along with its conservation as soil moisture, from as early as June to as late as September. In no case was there noted a depressing effect due to an overabundance of rainfall.

**Importance of soil pore space to newly planted trees and shrubs,** H. B. Tukey (*Farm Res.* [*New York State Sta.*], *6 (1940), No. 2, p. 3, figs. 3*).—Young apple, peach, pear, plum, cherry, oak, walnut, and elm trees and rose bushes responded favorably to the incorporation of wet peat with the soil at the time of planting. The underlying reasons for the better growth and survival of the peat-treated plants are discussed.

**Chemical constituents of some fruits grown in British Columbia,** F. E. Atkinson and C. C. Strachan (*Sci. Agr., 20 (1940), No. 6, pp. 321–328*).—The results of analyses made over a period of years on a large number of species and varieties of fruits are presented with discussion. There was found considerable difference in the content of certain constituents, such as sugar, in any given variety from year to year and in a given year in fruit produced in different locations.

**Results of some young apple tree pruning experiments,** T. J. Talbert (*Missouri Sta. Res. Bul. 313 (1940), pp. 23, figs. 10*).—Having observed that the drastic cutting back of young apple trees injured by rabbits, hail, or other causes resulted in the development of new branches and a satisfactory resumption of growth, the author set up an experiment with several varieties of apples. Almost invariably the cut-back trees produced lower and better-placed

branches with wider angles than did the control trees. Within the 4–5 yr., the trees cut back when young were practically as large and in some cases were larger than the controls. When cut back at planting or within 1 or 2 yr. thereafter, the trees showed no material difference in time of coming into fruiting. The response of other fruit and of shade trees was comparable. Cutting back is not suggested as a general orchard practice but offers a satisfactory remedial treatment for trunk-injured or weak trees. The best season for cutting was found to be early spring, just as growth was beginning.

In 1923 an investigation was undertaken to determine some of the effects on the young apple tree of different degrees of pruning. Heavy pruning an open-center type of tree had the greatest dwarfing effect as measured in trunk girth, tree spread, and height. Unpruned and lightly pruned trees made markedly more growth. The modified leader (light pruning) treatment decreased growth slightly and delayed initiation of fruiting somewhat, but gave a well-balanced tree which at profitable fruiting age produced as much or more fruit than the unpruned tree, and the fruit graded higher in quality. The heavily pruned open-headed trees came into profitable bearing later and yielded less fruit because of the reduced bearing surface. Unpruned trees, although earlier in bearing, were so dense as to yield much poorly colored and branch-scarred fruit. In addition, the unpruned trees tended to be shorter-lived.

**Fruit set in the apple following daily exposure of flowers to insect visits,** F. S. HOWLETT (*Ohio Sta. Bimo. Bul. 203 (1940), pp. 44–50, figs. 2*).—By covering branches of three varieties of apple—McIntosh, Stayman Winesap, and Rhode Island Greening—with large cheesecloth bags and removing them for a single day it was possible to determine the proportion of flowers developing into fruits after exposure to cross-pollination during a measured interval. Records were kept of prevailing temperatures, rainfall, and wind movement. One day's exposure produced a reasonable set in the diploid McIntosh but an insufficient set in the triploids Stayman Winesap and Rhode Island Greening. The greater fruit set in McIntosh is believed due to the inherent capacity of a greater number of cross-pollinated flowers to develop into fruits. The relation of the findings to the utilization of bees for stimulating or restoring cross-pollination is discussed.

**Calyx end structure in the Gravenstein apple,** H. P. BELL (*Canad. Jour. Res., 18 (1940), No. 3, Sect. C, pp. 69–75, figs. 7*).—A comparison of the development and structure of the calyx end of the Gravenstein with that of a number of other varieties indicated (1) that the calyx end of the Gravenstein exhibits an unusual degree of variation in its mode of development; (2) that at maturity it is usually composed of a tissue which is exceptionally fissured and porous; (3) that most of these fissures and pores are radial slits; and (4) that, as these openings are so unusually large and numerous in the Gravenstein, its calyx end must be structurally weaker than the corresponding structure in the other varieties. It is suggested that the prevalence of open core in this apple is due to the structural weakness of the calyx end.

**Sun-coloring apples in Delaware,** E. W. GREVE. (Del. Expt. Sta.). (*Peninsula Hort. Soc. [Del.] Trans., 53 (1939), pp. 112–116, fig. 1*).—Fruits of two McIntosh trees growing in the station orchards at Newark were picked on August 17, placed on straw spread beneath the trees, and allowed to lie until August 25. Pressure readings showed a decrease from 26.5 lb. on August 17 to 25 lb. a week later. At harvest only 13 percent of the apples were sufficiently colored to have passed the U. S. No. 1 grade for color. After 8 days on the straw 62 percent of the fruits would have met the color requirements, 4 percent had sufficient color to grade U. S. Fancy, and the apples had not softened to the point of decreasing their marketability.

**Dwarf pear trees,** W. H. Upshall (*Canad. Hort. and Home Mag., 63 (1940), No. 2, Growers' Ed., pp. 36, 41, 42, fig. 1*).—Observations in two orchards on four varieties of pear, Bartlett, Anjou, Vermont Beauty, and Clapp Favorite, on French seedling and on Angers quince roots showed definite dwarfing by the quince roots in all except Vermont Beauty, for which the trees were actually larger than the standard trees in one of the two orchards. In one orchard Clapp Favorite was the only variety to show hastening of fruiting by the dwarfing stock. In the other orchard, with more fertile soil, the quince roots hastened fruiting in all four varieties. In five of the eight comparisons dwarf trees outyielded the standards, but it was clearly evident that the standards would, because of their greater size, soon surpass the dwarf trees. On an acre basis, because of the greater number of dwarf trees, these trees would maintain their yield superiority longer than when estimated on a single-tree basis. The author states that Bartlett forms a weak union with quince, and that Anjou, Vermont Beauty, Clapp Favorite, and Howell form fairly strong unions but that all dwarf trees need support of some kind. Quince C from the East Malling Research Station offered greater promise as a stock for Bartlett.

**Seven new peaches and a new plum for the Western States,** W. F. Wight (*U. S. Dept. Agr. Cir. 552 (1940), pp. 23, figs. 14*).—Following a brief description of the deciduous fruit breeding work conducted at Palo Alto, Calif., there are presented data on seven new peaches—Leeton, Maxine, Penryn, Nestor, Stanford, Ellis, and Farida—and on one new plum—Padre—originating from the breeding activities.

**The response of the plum grown under hillculture conditions to modifications in cultural treatment,** J. M. Aikman and H. E. Brewer. (Iowa Expt. Sta. and U. S. D. A.). (*Bul. Ecol. Soc. Amer., 20 (1939), No. 4, pp. 26, 27*).—Commercial plums of five selected varieties were planted in 1938 on steep, eroded soil of the Lindley and Clinton types in southern Iowa. The variation in the response of the plants to seven cultural treatments on contour furrows and to minimum culture without furrowing was greater the second year than was evident the first year. The marked increase in food reserves of the plants in the more favorable treatments at the end of the first season probably accounted for the wide spread in growth behavior during the second season. The quantitative measurements taken to show response to the different cultural treatments in these tests were survival percentage, height increase, diameter increment, number and total length of permanent branches, and root development. Plants grown under minimum culture (hand cultivation to a radius of 1.5 ft.) in contour furrows showed slightly greater growth than those grown without furrows. Two furrows above the row of trees in the contour kept cultivated and the chisel plow effect which increased the rate of water percolation into the third foot of soil induced favorable growth response in the plants almost equal to clean cultivation, which is not practicable because of excessive soil erosion on the steep slopes.

**Concluding report on the harvesting investigation,** C. A. Doehlert. (N. J. Expt. Stas.). (*Amer. Cranberry Growers' Assoc., Proc. Ann. Mtg., 69 (1939), pp. 9–12*).—Over a period of 4 yr., plats of the Early Black cranberry laid out at Whitesbog, N. J., were harvested in three manners, (1) hand-picked, (2) scooped from a standing position, and (3) scooped from a kneeling position. Total yields over the 4 yr. were 356, 326, and 320 bbl., respectively, with 37, 64, and 54 bbl. of missed fruit. Interpreted in percentage, this meant losses of 10.9, 19.6, and 16.9 for the three types of harvesting. There was some evidence that the losses in the investigation were less than those occurring under general field conditions. There was a small decrease in the cropping capacity of the scooped plats as compared with the hand-picked plats, due, apparently, to injury

to the vines. Careful supervision of the pickers is considered a most important factor in harvesting cranberries. Furthermore, bogs in good cultural condition were scooped more successfully than those that had become weedy or otherwise out of condition.

**Raspberry nutrition.—IV, Can the Cuthbert raspberry be saved in coastal British Columbia?** G. H. HARRIS (*Sci. Agr., 20 (1940), No. 6, pp. 344–354, figs. 7*).—Continuing this series (E. S. R., 78, p. 53), the author discusses the results of investigations in which vigorous, healthy plants were grown in pots of sand and of soil and in the open field. In the sand cultures plants receiving a superabundance of P were outstanding in growth. N-deficient, P-deficient, and S-deficient plants showed marked deficiency symptoms. K deficiency was late to develop but upon appearance progressed rapidly and was characterized by bronze spotting and scorching of leaf tips and edges. Plants which received B, Zn, Cu, and Mg in addition to other nutrients showed some but not significant increase in growth. Sterilization of the soil used in pot cultures proved beneficial, and the addition of peat to sand increased growth. The best growth in the field resulted from a 5–10–5 NPK fertilizer supplemented with either S or with gypsum. Lime proved detrimental, suggesting that the soil reaction of pH 5.7 was favorable for the Cuthbert raspberry. In addition, lime lowered the percentage of available P in the soil. On light, upland soils water was apparently the chief limiting factor to successful growth. In conclusion the author suggests that Cuthbert raspberries may, with proper cultural treatment, be grown profitably in coastal British Columbia.

**The Sunrise red raspberry,** G. M. DARROW and J. H. CLARK. (Coop. U. S. D. A.). (*New Jersey Stas. Cir. 397 (1939), pp. [4], figs. 3*).—Originated from a cross between Latham and Ranere, made by the U. S. Department of Agriculture at Glenn Dale, Md., in 1920, this new variety has proved of commercial value in southern New Jersey and is being introduced for testing in other regions. Information is given on the characteristics of the plant and fruit which combine the desirable features of both parents. Cultural suggestions are included.

**Fertilizer applications and plant development of the strawberry, especially considering fall applications,** A. L. SCHRADER. (Md. Expt. Sta.). (*Peninsula Hort. Soc. [Del.] Trans., 53 (1939), pp. 137–140*).—Data on the dry-weight increases of matted-row and spaced strawberry plants fertilized with 800 lb. per acre of 6–6–5 NPK material on August 12 and September 11 showed much greater increments in the spaced plants, both in the crown and in the roots. Spacing alone was highly effective in increasing dry-weight production, but not to the extent of spacing plus fertilizer. Reducing the number of runner plants from 20 to 12 per mother plant caused increased gains in dry weight of both crowns and roots. There was no consistent difference attributable to the date of applying the fertilizer. In both cases fertilizers were effective in increasing dry weight of crowns and roots, a result which, in turn, was reflected in higher production of fruit the following spring. Under favorable conditions, root growth proceeded at a steady rate throughout the season except in densely matted rows without fertilizer. Crown development, on the other hand, was slow in the summer but increased rapidly in the early autumn, especially in the spaced plants.

**Grape training and pruning in Iowa,** S. W. EDGECOMBE and T. J. MANEY (*Iowa Sta. Bul. P7, n. ser. (1940), pp. 225–240, figs. 5*).—Information is presented relative to systems of training, fruiting, habit of grapevines, methods of pruning, varieties, control of pests, etc.

**Promising new grapes—some of the best of the blue or black kinds,** L. M. Van Alstyne (*Farm Res.* [*New York State Sta.*], *6* (*1940*), *No. 2, p. 16*).—In this fourth of a series (E. S. R., 82, p. 775), the author discusses the Sheridan, Watkins, Buffalo, Eden, Athens, and Kendaia grapes as to parentage, vine and fruit characters, desirability, and use. These varieties were originated and named by the station.

**Potash needed for development [of] muscadine grapes,** C. H. Ragland (*Miss. Farm Res.* [*Mississippi Sta.*], *3* (*1940*), *No. 5, p. 7*).—In a test in 1938 of different fertilizer treatments it was observed that 96 vines receiving potash with nitrogen and phosphorus or with nitrogen alone showed 27.3 percent of leaf scorch and yellowing, while of 50 receiving only nitrate of soda 90 percent were so affected. The vines receiving potash all showed marked improvement in growth, while those receiving nitrogen only continued to decrease in vigor.

**Leaf and fruit growth of the date in relation to moisture in a saline soil,** D. C. Moore and W. W. Aldrich. (U. S. D. A. et al.). (*Amer. Soc. Hort. Sci. Proc., 35* (*1938*), *pp. 216–222, figs. 3*).—One year's study of date palm responses to soil moisture indicated that when, during the summer, average soil moisture in a portion of the root zone was depleted to or below the permanent wilting percentage the rate of leaf elongation was reduced. Following the replenishment of depleted soil moisture by irrigation, the rate of leaf elongation was usually increased. The apparent sensitivity of leaf growth to amount of soil moisture suggests that the rate of leaf growth may be used as an index of water deficits in the palm. Water deficits in the palm, as indicated by reduced rate of leaf elongation, resulted in reduced rate of increase in fresh weight of fruit. While the fresh weight of the fruit was at its maximum or was decreasing just before tip softening, the rate of dry-matter increase in the flesh was at a maximum.

**Some effects of time of pollination and light intensity on seed production in the gladiolus,** E. F. Palmer and J. H. Child (*Canad. Gladiolus Soc. Ann., 1940, pp. 93–99*).—Noting difficulty in securing a satisfactory set of seed from pollinations made during the latter part of July and early August, the authors made studies of the effect of time of day and of shading by aster cloth on the success of pollinations. Based on total seed production, evening pollination was more effective than morning pollination, especially outside the cloth houses. Evening pollination in the cloth house was the most effective of the various sets of treatments. There appeared to be an association between daytime wilting and the poor results of outdoor morning pollinations. There were certain varietal combinations that did not follow the general rule. However, the cloth house made possible crosses which would otherwise have been impossible.

**Cormel germination experiments,** L. G. Klein and K. G. Laver (*Canad. Gladiolus Soc. Ann., 1940, pp. 67–72, fig. 1*).—In two successive years, cormels of several varieties of gladiolus were subjected to direct sunlight for different periods, with total darkness as the control. In both years the speed of germination was hastened by sunlight exposure prior to planting. A 2-hr. period gave the best results, with 5 hr. almost as beneficial. In one variety, Pasteur, a naturally poor germinator, germination increased up to 15 hr., the longest light treatment given. With most varieties, long exposure decreased germination. Some preliminary work with growth-promoting substances indicated that certain materials affect germination, but the results were insufficient to form a basis for definite recommendations.

**A simple method for the construction and operation of numerous gravel culture experimental plots,** D. C. Kiplinger and A. Laurie (*Ohio Sta. Bimo. Bul. 203* (*1940*), *pp. 55–58, fig. 1*).—A description is presented of equipment devised and operated satisfactorily by the department of floriculture.

**Care of ornamental trees and shrubs,** F. L. Mulford (*U. S. Dept. Agr., Farmers' Bul. 1826 (1939), pp. [2]+80, figs. 45*).—General information is offered regarding various cultural considerations, such as adaptation, spacing, soil management, fertilization, pruning, control of pests, and peculiar requirements of various species.

## FORESTRY

***Significance and applicability of seed maturity indices for ponderosa* pine,** T. E. Maki. (U. S. D. A.). (*Jour. Forestry, 38 (1940,) No. 1, pp. 55–60, fig. 1*).—Emphasizing the need of a reliable index of seed maturity in order that cones may be collected at the proper stage of development, the author discusses experiments in a stand of second-growth ponderosa pine near Idaho City, Idaho. Beginning July 7, cones were harvested at 10-day intervals. The records showed that the time of collection influenced markedly the amount of self-extracted seed, the mean weight of seed per cone, the germinative capacity, and the specific gravity of the freshly picked cones. Prior to August 6 none of the cones yielded any self-extracted seed. The two latest collections, August 26 and September 5, gave significantly heavier yields of seed per cone than did the earlier collections. Germinative capacity increased with delay in harvest, suggesting the desirability of permitting as much of the ripening as is practicable to occur while the seed is still in the cone on the tree. There was a highly significant decrease in specific gravity of the cones as the season advanced, dropping from 0.92 on July 27 to 0.74 on September 5. In the same period the percentage of extracted seed rose from 0 to 91.6 and the germination from 0 to 74.1. An acceptable self-extraction and germinative-capacity percentage was reached in the cone specific gravity value of 0.85. The color of the cones was not found reliable for determining their degree of ripeness.

**The size of Scotch pine cones as related to seed size and yield,** E. J. Eliason and C. E. Heit (*Jour. Forestry, 38 (1940), No. 1, pp. 65, 66*).—There was observed a definite positive relationship between the size of an individual cone and the size and number of seeds. On a volume basis, the smallest cones produced as many viable seeds as the largest. Seed from the larger cones produced the larger trees. Seed from the smallest cones not only produced the smallest trees but also the fewest trees per gram of seed. Cones above 1.5 in. in length were of approximately equal value as a source of seed.

**Vegetative propagation of conifers, IV, V** (*Canad. Jour. Res., 18 (1940), Nos. 1, Sect. C, pp. 13–17; 4, Sect. C, pp. 122–128*).—In continuation of this study (E. S. R., 82, p. 490), two papers are presented, as follows:

IV. *Effects of cane sugar, ethyl mercuric phosphate, and indolylacetic acid in talc dust on the rooting of Norway spruce*, N. H. Grace.—Cuttings were collected in November from the upper part of 18-year-old trees and stored outside until December 21. They were then treated with a series of talc dusts containing indoleacetic and naphthylacetic acids, each at 1,000 and 5,000 p. p. m., combined in certain cases with cane sugar (10 percent) and ethyl mercuric phosphate (50 p. p. m.). Indoleacetic acid at 1,000 p. p. m. increased rooting, as recorded at the end of 3 mo., by about 10 to 42.5 percent, but at 5,000 p. p. m., it significantly reduced rooting. Naphthylacetic acid reduced rooting at both dilutions. Indoleacetic acid in the absence of sugar increased the mean length of roots formed. Organic mercury alone or in combination with indoleacetic acid reduced root length, but sugar and mercury in combination had no decreasing effect over any one singly.

V. *The effect of indolylacetic acid and nutrient solutions on the rooting of Norway spruce cuttings*, N. H. Grace and M. W. Thistle.—Norway spruce cuttings

collected in November 1938 and treated in three experiments with a series of solutions containing different concentrations of indoleacetic acid failed to root as freely as the controls, and mortality was increased by treatments. The addition of nutrient salts to the treatment solutions further reduced rooting and increased mortality of the cuttings. These harmful results with solutions were contrasted with the beneficial effects secured with the same materials in talc dust.

**Origin and growth of dormant buds in oaks,** F. G. Liming. (U. S. D. A.). (*Jour. Forestry, 38 (1940), No. 3, p. 226*).—Oak sprouts originate from dormant buds, that is, buds that are formed in acropetal order on 1-year-old stems and do not develop into branches the following year. Although the buds do not unfold, each year the bases of the stem tips increase in length an amount equal to the width of the annual ring, thus keeping the bud on the outside of the wood. The bud traces so formed are dwarfed, greatly modified branches, encased in the xylem of the main stem. Oak sprouts which develop from these buds are, in reality, branches whose development has been delayed. There is not a sufficient number of buds formed in the axils of normal leaves to account for the large number of sprouts frequently found on stumps. Additional buds are formed between the bases of pairs of bud scales, which are modified stipules, in positions corresponding to the axils of the undeveloped or aborted leaf blades and petioles.

**Factors affecting the response of forest vegetation to trenching,** E. F. Wallihan. (Cornell Univ.). (*Jour. Forestry, 38 (1940), No. 3, pp. 223, 224*).—In April 1937 two of four plats established in a second-growth stand of red oak-basswood-white ash type about 40 yr. old, located near Ithaca, N. Y., were trenched. Measurements at the end of the first growing season showed no growth response due to trenching. Although soil moisture was more abundant during the growing period in the trenched plats, moisture never approached the wilting percentage in any of the four plats. Analyses of black ash leaves collected near the close of the growing season indicated that the plants in the trenched area received a significantly greater amount of N than did trees on the control plats. Soil analyses failed to show any such difference between the plats.

A measurable growth response observed in the second growing season on one of the trenched plats apparently was correlated with better light conditions. Readings with a Weston sunlight meter showed this plat to receive a significantly larger amount of light.

In a second set of plats, four trenched and four controls, established in a stand in which light intensities varied from 5 to 35 percent full sunlight, it was again found that trenching resulted in an increased absorption of N by the plants, although no growth response was noted during the first growing season following trenching.

**The influence of grazing upon certain soil and climatic conditions in farm woodlands,** R. F. Chandler, Jr. (Cornell Univ.). (*Jour. Forestry, 38 (1940), No. 3, p. 228*).—The organic matter content of ungrazed woodlands averaged 8.5 percent, as compared with 6.4 percent for grazed areas. The average volume weight of ungrazed soils was 0.92 and of grazed 1.15. The average soil moisture contents at time of sampling were 14.4 percent for ungrazed and 10.6 percent for grazed areas. Air and soil temperatures were lower on ungrazed areas, and light intensity at ground level (expressed as percentage of full sunlight) was 3.08 in the ungrazed and [illegible] in the grazed woods. The relative humidity of the air 1 ft. above the soil averaged 65.7 percent in the ungrazed and 53.6 percent in the grazed area.

**Timber marketing problems in the central hardwood region, R. C. Brundage.** (Purdue Univ.). (*Jour. Forestry, 38 (1940), No. 3, pp. 227, 228*).—Marketing studies in Indiana indicated that less than 10 percent of the woodland owners selling timber have definite knowledge of the volume or quality of timber sold. An analysis of walnut sales showed that stumpage prices were from 20 to 100 percent greater for owners who knew values or who marketed graded logs delivered to consuming industries. One of the major problems was the marketing of low-grade timber and such species as elm, beech, and hickory.

## DISEASES OF PLANTS

**Crop losses from plant diseases in the United States in 1938, H. A. Edson and J. I. Wood** (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1939, Sup. 118, pp. 85–118*).—Tabulated data are included for apple, barley, dry and green beans, cherry, field and sweet corn, cotton, grape, oats, peach, pear, peas for manufacture and for market, potato, rye, strawberry, sugar beet, sweetpotato, tobacco, tomatoes for manufacture and for market, and wheat.

**The Plant Disease Reporter, [April 1 and 15, 1940]** (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 24 (1940), Nos. 6, pp. 121–137, figs. 2; 7, pp. 139–152, figs. 2*).—The following items are noted:

*No. 6.*—Sixth experimental forecast of the incidence of bacterial wilt on sweet corn, by N. E. Stevens and C. M. Haenseler; leaf crinkle of geranium, by P. P. Pirone; notes on the list of virus diseases of stone fruits, by K. S. Chester; occurrence of curly top in the Pacific Northwest in 1939, by B. F. Dana; some isolations of *Verticillium* in Illinois during 1938 and 1939, by J. C. Carter; a *Cercospora* leaf-spot disease of *Nandina*, by J. A. Stevenson; and brief notes on *Ustilago vaillantii* on *Bellevalia*, stinking smuts of wheat from Afghanistan in 1939, and bacterial ring rot of potato in North Dakota.

*No. 7.*—Foreword to the revised check list of diseases of economic plants of the United States now in progress, with sample section on *Abies* spp., by F. Weiss; and bleeding canker (*Phytophthora cactorum*) on beech and Norway maple in Rhode Island and Massachusetts, by F. L. Howard.

**[Abstracts of papers on plant diseases]** (*Peninsula Hort. Soc. [Del.] Trans., 53 (1939), pp. 20–26, 46–48, 102–111, 117–119, 141–149, 162–165*).—The following are of interest to phytopathology: Disease Resistant Potato Varieties in Maryland, by R. A. Jehle (Univ. Md.); The "X" Disease of the Peach in the Northeastern States, by T. F. Manns and S. L. Hopperstead, and Studies on the Control of the Peach Leaf Curl, by S. L. Hopperstead and K. J. Kadow (both Univ. Del.); Scab of Apples in Storage, by E. A. Walker (Univ. Md.); Principles of Fruit Disease Control as Related to Orchard Spraying, by K. J. Kadow (Univ. Del.); and Red Stele Root Rot of Strawberry, by C. E. Temple, and Influence of New Sprays and Dusts in the Control of Cantaloupe Defoliation and Improvement of Fruit Quality, by C. H. Mahoney and H. L. Stier (both Univ. Md.).

**[Plant pathological studies by the Missouri Station]** (*Missouri Sta. Bul. 413 (1940), pp. 29–35, 80, 106, 107*).—Reports are given on the effect of seed treatments for smut on yields of oats, by C. M. Tucker; control of barley diseases, by Tucker, J. J. White, and J. E. Livingston; the microflora of corn root and scutellum rots, by Tucker and C. G. Schmitt; the effects of various treatments of seed corn on stands and yields, by Tucker; *Fusarium lycopersici* tomato wilt studies, by Tucker and G. W. Bohn; an infectious disease of mushrooms of undetermined cause and an undescribed disease of Korean lespedeza, both by Tucker and K. W. Simons; *Bacterium pruni* canker of

sweet cherry, apple measles, and the identification of miscellaneous plant diseases, all by Tucker; and a chemical investigation of virus diseases of plants, by C. G. Vinson.

**[Plant disease studies by the Washington Station].** (Partly coop. U. S. D. A.). (*Washington Sta. Bul. 384 (1939), pp. 14, 49, 50, 55–62*).—Brief reports are given on the following studies: Resistance of wheat to bunt and other diseases and its inheritance, by E. F. Gaines and O. A. Vogel; bitter pit and related pome fruit diseases in pears, by E. L. Overholser, F. L. Overley, and A. L. Kenworthy; wheat smuts, including new races of *Tilletia tritici* and *T. levis*, and oat smuts, including new races of *Ustilago avenae* and *U. levis*, both by C. S. Holton, F. D. Heald, and Gaines; etiology and control of apple rots and etiology and prevention of alfalfa failures, both by Heald and R. Wellman; pear rots, by Heald and H. English; diseases of forage grasses, by G. W. Fischer; etiology and control of sugar beet diseases, and bean rust (*Uromyces appendiculatus*), both by L. Campbell; virus diseases of brambles and of potato and other Solanaceae, and diseases of glasshouse plants, all by L. K. Jones; virus diseases of peas, by Jones and F. Johnson; and plant disease survey, including parasitic, virus, and nonparasitic diseases, by Heald, Jones, and G. A. Huber.

**[Phytopathological studies by the Western Washington Station]** (*Western Washington Sta. Rpt. 1939, pp. 35, 36, 37–40*).—Brief reports are given on pea seed treatment to prevent rotting in the soil; control of diseases of bulbs (daffodil, tulip, and gladiolus), by G. A. Huber; and breeding raspberries resistant to mosaics and aphids, brown rot of stone fruits due to *Sclerotinia laxa* and *S. fructicola* and their control (together with thrips), studies of potato diseases, including net necrosis and internal brown rot, and the correction of alfalfa bronze top by boron, all by Huber and K. Baur.

**Additions to Florida fungi, I–V,** W. A. Murrill. (Fla. Expt. Sta.). (*Bul. Torrey Bot. Club, 66 (1939), No. 1, pp. 29–37, figs. 3; 67 (1940), Nos. 1, pp. 57–66; 2, pp. 145–154, fig. 1; 3, pp. 227–235; 4, pp. 275–281*).—This series includes new species and notes on interesting fungi found from time to time in the State. Investigations on plant diseases in Florida are said to be only preliminary, and this is particularly true of diseases due to basidiomycetes. Many of the species in this large group are still unknown, and the harm they do is unsuspected, as illustrated in *Corticium, Thelephora, Hydnum, Merulius*, or *Poria*. During the past few years, the author has been attacking the problem in a taxonomic way, devoting particular attention to Alachua County near the center of the State in a region rich in both pinelands and hammocks. This series is the result.

**Outline of the fungi,** G. W. Martin (*Iowa Univ. Studies Nat. Hist., 18 (1940), No. 1, pp. 40*).—This is a reprint, with certain changes, of A Key to the Families of Fungi, Exclusive of the Lichens.[3] Many of the keys have been rewritten and an attempt has been made to utilize more fully the secondary characters, which in many cases are more obvious than those regarded as more fundamental. There have been rearrangements of many of the groups and revisions of some of them, the glossary has been enlarged and corrected, and an index has been added.

**A new Cercospora on Lippia cardiostegia,** B. H. Davis. (Ohio State Univ.). (*Mycologia, 32 (1940), No. 2, pp. 170, 171, fig. 1*).—*C. cardiostegiae* n. sp. is described and illustrated.

**Contributions to the life history of a systemic fungous parasite, Cryptomycina pteridis,** S. Bache-Wiig (*Mycologia, 32 (1490), No. 2, pp. 214–250,*

[3] Iowa Univ. Studies Nat. Hist., 17 (1936), No. 3, pp. 81–115.

*figs. 26*).—*C. pteridis*, cause of a leaf roll disease of bracken ferns and studied in relation to the eastern bracken (*Pteridium latiusculum*), was found to be systemic and perennial, overwintering in stem buds and fronds and persisting indefinitely in a given diseased plant. Inoculations and the pathogenesis and host-parasite relations of the disease are discussed in detail. The fungus enters the host by sending a penetration tube through the wall of an epidermal cell, and the hyphae grow rapidly from cell to cell. There are 33 references.

**The species concept in Fusarium,** W. C. SNYDER and H. N. HANSEN. (Univ. Calif.). (*Amer. Jour. Bot., 27 (1940), No. 2, pp. 64–67*).—The species concept presented recognizes fully the variation phenomena of the genus, and in employing this concept in its taxonomy, particularly as to the section *Elegans*, it has seemed necessary to revise the classification system hitherto used. The necessity for this is indicated by analyses of many former "species" by means of large numbers of single spore cultures which have shown that the progeny may fall into more than 1 species or subsection of the genus as formerly constituted. A system of taxonomy is proposed for the *Elegans* section in which the 10 species, 18 varieties, and 12 forms of Wollenweber and Reinking are placed in 1 species, *F. oxysporum*, on the sole basis of morphology. On the basis of pathogenicity alone, 25 parasites of the section are here made forms of this common species. The system proposed is a modification of the Wollenweber-Reinking system, on which it is based, and it is believed to possess the advantages of greater simplicity and usability.

**Additions to the powdery mildew flora of Pennsylvania,** E. REESE. (Pa. Expt. Sta.). (*Pa. Acad. Sci. Proc., 13 (1939), pp. 70–75*).—The purpose of this contribution was to extend the range of the work by Overholts and Campbell (E. S. R., 74, p. 790) to include the northeastern part of the State. The present study included the measuring of perithecia, asci, spores, and appendages; counting appendages, asci, and spores; and looking for irregularities in form. Some of the more pronounced variations are listed and tabulated, and a host index is provided.

**The chemistry of resistance of plants to Phymatotrichum root rot.—IV, Toxicity of phenolic and related compounds,** G. A. GREATHOUSE and N. E. RIGLER. (U. S. D. A. and Tex. Expt. Sta.). (*Amer. Jour. Bot., 27 (1940), No. 2, pp. 99–108*).—Continuing the series (E. S. R., 81, p. 657), a total of 45 phenolic and related compounds tested on the growth of *P. omnivorum* in culture is said to indicate that when 1 group only is attached to benzene the order of effectiveness is $OH > SH > COOH > CHO > OCH_3$, and that when 2 groups are attached the toxicity depends not only on the nature of the 2 groups but also on their position with respect to each other around the ring, but the effect of position is not always consistent. Introduction of a second group into phenol or thiophenol decreases the effectiveness, while combination of a second group with benzoic acid or anisole, containing a less effective group, increases their activity. Methylation of phenols decreases toxicity except where the 2 hydroxyls are meta to each other. Addition of a basic amino group in the ortho position to hydroxyl increases toxicity enormously, while the same group in the meta or para position decreases it. The methylation of hydroxyl, as in the anisidines, makes ortho, meta, and para of the same order of toxicity. The effect of adding a carboxyl depends on the fungistatic activity of the group already present, e. g., if it is potent the compound formed is less toxic, while if it is weak the toxicity is greatly enhanced. With more than 1 group present, the aldehyde group seems about equal to the carboxyl group. Substitution of S for O to form thiophenols results in decreased potency. The effectiveness of polysubstituted benzenes proved difficult to predict. When alkyl groups are added activity is increased,

but when a number of hydroxyl groups are present it is usually lessened. Pyrogallol was an exception, since it was very toxic in contrast to its isomer, phloroglucinol. Isomerism is thus seen to play an important role in all types of compounds.

**Need of reinvestigation on the use of Trichoderma as a means of biological control,** T. MATSUMOTO (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaisi), 11 (1939), No. 4, pp. 322–326, figs. 2; Eng. abs., p. 326*).—A root rot of garden roses, crotons, etc., noted for several years in Takhoku has been invariably accompanied by mycelial strands of a fungus apparently closely related to the *T. koningi* causing root rot of apple. According to inoculation tests, the Japanese fungus appears to be a weak parasite, attacking plants only when they are rendered susceptible by transplanting or other causes, but the disease is said to be widespread and to cause severe damage. The fungus also attacks *Hypochnus sasakii* in culture, parasitizing the growing hyphae, inhibiting their growth, and finally killing them. When *H. sasakii* was placed on a leaf of *Eichhornia crassipes* in close contact with the author's *Trichoderma*, very little, if any, infection occurred as contrasted with heavy infection in the absence of the *Trichoderma*. In the light of these results, the author suggests reinvestigation of the use of *Trichoderma* as a means of biological control.

**The problem of active immunity of plants against Pseudomonas tumefaciens,** H. G. P. DUYFJES (*Het probleem der actieve immunisatie van planten tegen Pseudomonas tumefaciens Smith en Town. Proefschr., Rijksuniv., Utrecht, 1935, pp. VI+[1]+100, [pls. 7], figs. 2*).—This dissertation includes a review of the literature (over 3 pages of references), immunization trials on *Bryophyllum* and *Pelargonium*, and studies of the influence of a previously existing tumor on reinfection, influence of several equally developed tumors on one another, localization of *Pseudomonas tumefaciens* in plants with tumors, and *P. tumefaciens* bacteriophage.

**Descriptions of tropical rusts, [I], II,** G. B. CUMMINS. (Ind. Expt. Sta.). (*Bul. Torrey Bot. Club, 64 (1937), No. 1, pp. 39–44, figs. 2; 67 (1940), No. 1, pp. 67–75, figs. 10*).—The first of these contributions includes one new genus (*Lipocystis*), four new species, and two new combinations; the second contains new taxonomy for the genera *Puccinia, Bubakia, Dicheirinia, Acrotelium, Scopella,* and *Uredo.*

**Variations in systemic infections of Uromyces caladii,** S. M. PADY (*Kans. Acad. Sci. Trans., 42 (1939), pp. 151–155, fig. 1*).—Studying the balance between host and parasite in *U. caladii*, a rust whose haploid mycelium is systemic and perennial in *Arisaema triphyllum* and *A. dracontium*, the author presents detailed measurements of variations in infection on individual leaves and leaflets. Complete and all degrees of partial infection were found, and the possible bases for these results are discussed.

**Additions and corrections to Ustilaginales,** G. L. I. ZUNDEL (*North Amer. Flora, 7 (1939), No. 14, pp. 971–1045*).—Many additions and corrections to the original text[4] of this order accumulated by Clinton (E. S. R., 77, p. 736), have been utilized in this text, "prepared by the fellow worker who was associated with him for many years in the study of this group of plants." Keys are included to the genera and species of the families Ustilaginaceae and Tilletiaceae, and a revised host index to the order is provided by J. H. Barnhart.

**Recent advances in the study of viruses,** W. M. STANLEY (In *Science in progress*, edited by G. A. BAITSELL. *New Haven, Conn.: Yale Univ. Press; London: Oxford Univ. Press, 1939, pp. 78–111, figs. 10*).—A comprehensive review.

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[4] North Amer. Flora, 7 (1906), No. 1, pp. 82.

**New views in virus disease research,** L. O. Kunkel (In *Science in progress*, edited by G. A. Baitsell. *New Haven, Conn.: Yale Univ. Press; London: Oxford Univ. Press, 1939, pp. 112–132, figs. 4*).—A critical review, with particular reference to tobacco mosaic and to other plant viruses, including those affecting aster and peach.

**Virus diseases with cultivated plants, especially potatoes,** H. M. Quanjer (*18. Internatl. Cong. Agr., Dresden, 1939, Sect. 4, Main Rpts., pp. 11–15*).—A brief review of the history of plant virus researches, including the ecological and pathological theories with the mutual international completion of research indicating their virus nature, the continuously arising new problems, and combating virus diseases of potatoes and other vegetatively propagated plants.

**Evidence for the identity of the yellow-spot virus with the spotted-wilt virus: Experiments with the vector, Thrips tabaci,** K. Sakimura. (Hawaii. Pineapple Prod. Expt. Sta.). (*Phytopathology, 30 (1940), No. 4, pp. 281–299, figs. 4*).—The pineapple yellow spot virus was recovered by *T. tabaci* from field-infected tomatoes and by the same insect was transmitted to and recovered from spinach, broadbean, celery, potato, eggplant, bell pepper, tomato, tobacco, *Nicotiana glutinosa, Datura stramonium*, petunia, chicory, endive, and lettuce, all known to be susceptible to the spotted wilt virus of Australia, Europe, Africa, India, and North and South America. The symptoms produced on these plants, except spinach, endive, and chicory (no published descriptions available), were identical with those of the spotted wilt virus, and the latent periods were also generally analogous. Beet, chard, cabbage, and New Zealand spinach, nonsusceptible to spotted wilt virus, were also not infected by the yellow spot virus. It seems clear that the two diseases are due to the same virus.

**Intranuclear inclusions in virus infected plants,** B. Kassanis (*Ann. Appl. Biol., 26 (1939), No. 4, pp. 705–709, pl. 1*).—Of the two kinds of inclusions described in solanaceous plants infected with severe etch virus, one occurs in the cytoplasm and resembles the X-bodies of many other plant virus diseases and the other occurs only in the nuclei. These intranuclear inclusions appear to be crystalline, of the form of rectangular plates, and resemble the inclusions described in the polyhedral disease of silkworms.

**A miniature root-observation box,** M. B. Linford. (Hawaii. Pineapple Prod. Expt. Sta.). (*Phytopathology, 30 (1940), No. 4, pp. 348, 349*).—For microscopic observations of root pathology and development by reflected light, the author describes a plant culture box utilizing 2- by 3-in. microscope slide glasses as sides.

**Ethyl mercury iodide—an effective fungicide and nemacide,** W. E. Lammerts (*Phytopathology, 30 (1940), No. 4, pp. 334–338, figs. 2*).—The Bayer-Semesan Company's DuBay 1155–HH, containing as the toxic ingredient 5 percent ethyl mercury iodide, completely controlled pre- and postemergence damping-off in seed flats, 1.5 gm. per square foot followed by a waiting period of 4–7 days proving the most effective treatment. When thoroughly mixed with infested potting soil, 2–3 gm. per square foot completely eradicated the nematodes.

**Effects of boron deficiency and excess on plants,** S. V. Eaton (*Plant Physiol., 15 (1940), No. 1, pp. 95–107, figs. 7*).—The main signs of boron deficiency in sunflower and soybean were dying of the stem tip and chlorosis and malformations of the young leaves. The main sign of boron toxicity in sunflower was a mottling of the older leaves followed by death of affected tissues. Thus B deficiency affects the youngest leaves first and toxicity the oldest. Sunflowers require a rather large amount of B for optimum growth and are not injured until the concentration becomes relatively high, while soybeans

require a rather small amount and are injured by comparatively low concentrations. The more vigorous the growth the more pronounced were the B deficiency signs, but the less pronounced were the toxicity symptoms. Soybeans developed B deficiency sooner when grown in summer than in fall, while studies by others have indicated greater toxicity in fall- or spring-grown plants than in those grown in summer. There may be better growth at definitely toxic B concentrations. The range between B deficiency and toxicity proved quite narrow, at 0.5 p. p. m. affording good growth for sunflower but at 1 p. p. m. proving definitely toxic. There are 20 references.

**Black kernel and white tip of rice,** A. L. MARTIN and G. E. ALTSTATT (*Texas Sta. Bul. 584 (1940), pp. 14, figs. 2*).—"Black kernel and white tip of rice are common troubles causing losses to rice growers each year. Laboratory and field experiments indicate that black kernel can be reduced by preventing heating of rice in stacks and in storage, and by the elimination of old rice straw and other organic material upon which the fungus [*Curvularia lunata*] lives from season to season. White tip appears to be due to a lack of balance between magnesium and calcium in the soil. Trials on a small scale to determine the needs of a particular soil are suggested."

**Observations on stem rust epidemiology in Mexico,** E. C. STAKMAN, W. L. POPHAM, and R. C. CASSELL. (U. S. D. A. and Minn. Expt. Sta.). (*Amer. Jour. Bot., 27 (1940), No. 2, pp. 90–99, fig. 1*).—From this survey and review (22 references) it is concluded that the uredial stage of *Puccinia graminis tritici* can persist throughout the year in southern Mexico, but that it could probably be controlled to a considerable extent there by eliminating the relatively small amount of summer wheat and the prematurely sown winter wheat. Races 38 and 59 have comprised more than 80 percent of all the isolates in southern Mexico (1928–31 and 1938 and 1939), none of the 14 other races being found prevalent enough to be important. In northern Mexico races 38, 49, and 56 ranked in that order of prevalence (1928–39). Evidently there has been very little interchange of rust between southern Mexico and the wheat areas of northeastern Mexico and the United States during the past 10 yr. From a study of the spores in the air and subsequent rust development it appears that there is sometimes a seasonal interchange of infection between the United States and northern Mexico by urediospores blown from the United States in the fall and from Mexico in winter or early spring. The tendency of certain physiologic races to prevail in the 2 regions also supports this conclusion. The prevalence of race 38 in southern and northern Mexico and in the United States could be construed as indicating interchange among these 3 regions, but, on the other hand, this race appears well adapted to overwintering from central Texas southward and is commonly isolated from rusted barberries in the Ohio Valley and eastern United States, which could well explain its general prevalence. The uredial stage appears to persist throughout the year, at least to some extent, in certain mountain valleys of northern Mexico, but the importance of this survival and the role of native barberries or Mahonias, numerous in some of the Mexican wheat areas, are not yet known.

**Physiologic races of oat smuts,** G. M. REED (*Amer. Jour. Bot., 27 (1940), No. 3, pp. 135–143*).—On the basis of behavior on definite strains and varieties of 9 oat species, 29 physiologic races of *Ustilago avenae* and 14 of *U. levis* have been differentiated, for which purpose 17 host strains were required for loose and 10 for covered smut. With favorable conditions, susceptible hosts gave 75–100 percent infection, whereas the resistant ones gave only a few smutted plants or none. Some varieties have consistently given variable results, Red

Rustproof, e. g., usually ranging from 45 to 60 percent infection. Some specialized races are sharply limited to a very few strains or varieties of oats, while others occur on a wide range of hosts belonging to various species. One or more strains of all species, however, are susceptible to at least 1 race of loose or covered smut. A few oats exhibited a wide range of susceptibility to the specialized races, and, so far as tested, *Avena barbata* is susceptible to all. Canadian proved susceptible to 28 races of loose smut and 13 of covered smut, being resistant to 1 race of each. Monarch was susceptible to most races of covered as well as to many of loose smut. Markton, Navarro, and Victoria have shown a marked resistance following inoculation with practically all the races of both smuts.

**Varieties of Triticum vulgare practically immune in all stages of growth to stem rust,** R. F. PETERSON, T. JOHNSON, and M. NEWTON (*Science, 91 (1940), No. 2361, p. 313*).—In searching for wheats for breeding, one of the aims has been to secure immunity at all growth stages to all physiological races of *Puccinia graminis tritici.* Of those tested, 6 are said to have apparently met these requirements. Every year since their receipt in 1934–35 they have been subjected to artificially induced epidemic conditions using ±30 physiologic races collected in various parts of Canada, but apart from an occasional trace of rust all 6 varieties have appeared to be immune to all these races.

***Treated grain displays little injury during storage,*** W. F. CROSIER (*Farm Res.* [*New York State Sta.*], *6 (1940), No. 2, pp. 6, 14, fig. 1*).—The experiments and observations reported appear to indicate that removal of ethyl mercuric phosphate from seed grain in either the solid or vapor form is unnecessary and practically impossible, and that the chemical on stored grain retains its fungicidal value. Neither water nor an air current separated the chemical from the seed. Prolonged storage of properly treated dry seed oats in grain sacks did not reduce their yielding ability, and results from a stock of well-dried wheat treated and held for 7 mo. showed only a slight decrease in yield due to storage. Although the results of this study apply particularly to the type of storage used in large warehouses, they are believed to indicate clearly that treated seed placed in grain sacks can be held over from one year to the next in the barn. A germination test will always serve as a guide to the planting value.

**Barberry eradication in Pennsylvania,** L. K. WRIGHT and R. S. KIRBY. (U. S. D. A. and Pa. State Col.). (*Pa. Acad. Sci. Proc., 13 (1939), pp. 41, 42*).—A progress report.

**Boron deficiencies in Connecticut,** B. A. BROWN. ([Conn.] Storrs Expt. Sta.). (*Science, 91 (1940), No. 2362, p. 338*).—This is a report of alfalfa yellows on what is said to be one of the best agricultural soils in Connecticut, where all symptoms of boron deficiency were absent with addition of borax at the rate of 20 lb. per acre. Reports also indicated a widespread occurrence of internal cork of apples in the State the past season, showing that apparently other crops under certain soil and weather conditions might be benefited by boron.

**Seed treatments for cotton,** K. S. CHESTER (*Oklahoma Sta. Cir. 89 (1940), pp. 8*).—An informational circular on cotton disease control by seed treatment.

**Cottonseed treatment,** R. J. HASKELL and H. D. BARKER (*U. S. Dept. Agr. Leaflet 198 (1940), pp. 8, figs. 4*).—An informational leaflet on cotton seedling failures and methods and apparatus for control by seed treatment.

**On the effect of substances, produced by fungi, on the respiration of the tissue of potato tubers, I, II,** J. J. A. HELLINGA (*K. Nederland. Akad. Wetensch. Proc., 43 (1940), No. 2, pp. 249–266, 267–276, figs. 8*).—This preliminary report is in two parts, as follows:

I. The effect of even extremely low concentrations of extracts of *Gibberella saubinetii* and other fungi on the respiration of thin potato tuber discs, studied by the Warburg manometer method, was to induce a quick and usually constant and stable increase in rate. The active substances proved to be thermostable, nonvolatile, and insoluble in ether and chloroform, but were adsorbed by activated charcoal and by asbestos filter plates, from which they could be rinsed out. The agent failed to alter the respiratory quotient of the potato tissue. When respiration was blocked by HCN the agent failed to exert its influence on the residual respiration, thus giving evidence that it affects the HCN sensitive polyphenol-oxidase system of the potato.

II. It was found that the substances noted above are not specifically produced by *G. saubinetii*, various Fusariums, yeast, and crude peptone proving to contain material similarly active on the respiration of potato tissue. A number of substances, such as biotin, aneurin, lactoflavin, inositol, ascorbic acid, indole-3-acetic acid, histidin, etc., proved to be almost inactive on potato tissue respiration; the effect of sugars was independent of the action of the fungus extracts on respiration; and the sugar effect could not be ascribed to the interaction of bacteria. Furthermore, the effect of the agent in the extracts was not due to an oxidation of some added oxidizable substrate.

**Potato tuber net-necrosis and stem-end browning studies in Maine,** D. Folsom and A. E. Rich. (Maine Expt. Sta.). (*Phytopathology, 30 (1940), No. 4, pp. 313–322, fig. 1*).—In certain varieties net necrosis of potato tubers is an occasional transitory symptom of leaf roll and is distinguishable both microscopically and macroscopically from the nonparasitic stem end browning of similar tubers. Though an outbreak of net necrosis indicates an unusual spread of leaf roll the preceding season, the ratio varies greatly with individual seed stocks. In Maine, stem end browning occurs more in some seasons than others, and when present is usually more abundant in some parts of the State than in others. It appeared to have no correlation with vigor or yield rate in the next generation of plants and was not perpetuated in the tubers. Neither was any correlation found with various possible causes, such as soil type, previous occurrence in the soil, fertilizer treatment, soil nutrients, pH or water, presence of recognizable virus disease, origin of commercial seed strain, injury to parent plants, time or manner of digging, and certain storage conditions. Through successive seasons, however, it appeared more troublesome on certain farms and in certain fields. In a given storage lot, stem end browning was negatively correlated with tuber weight, while the reverse was true for net necrosis. Neither trouble increased after December 15 (winter of 1937–38), and both required some weeks to reach their maximum development in storage.

**A promising method for eradicating bacterial wilt and ring rot from the potato,** C. H. Metzger and D. P. Glick. (Colo. State Col.). (*Amer. Potato Jour., 17 (1940), No. 2, pp. 45–53*).—Of 4,880 tubers (19 lots and 9 varieties) examined microscopically, 20 percent were discarded, although only a small proportion of them were believed to have been actually infected. These discards varied in individual lots from 2 to 52 percent. Of 1,684 stem smears (421 tuber units and 14 lots), 5 percent exhibited micro-organisms, resulting in the discarding of 11 percent of the units. An additional lot of 714 stem smears from 1 potato field were apparently free from infection. When only 1 type of smear can be examined, that from the stem base is believed to give the most reliable index to infection. These methods are believed adaptable to the eradication of bacterial wilt and ring rot infection from potato seed stocks. There are 27 references.

**Ring rot control methods outlined,** C. H. METZGER (*Colo. Farm Bul.* [*Colorado Sta.*], *2 (1940), No. 2, p. 18*).—A brief summary of approved procedures for controlling this bacterial potato disease.

**A mosaic disease of rape and other cultivated crucifers in China,** L. LING and J. Y. YANG (*Phytopathology, 30 (1940), No. 4, pp. 338–342, figs. 2*).—A mosaic virus of rape and four other crucifers (turnip, Chinese cabbage, leaf mustard, and Chinese radish), distinct from the turnip mosaic virus of the United States, is reported prevalent in China. This virus failed to attack cabbage or cauliflower. The symptoms vary slightly on different hosts but are characterized by systemic, coarse-vein clearing, vein banding, mottling, and distortion of the leaf, and in some hosts by stunting. Above 20° C. the symptoms are usually masked. The virus may be transmitted by the green peach aphid (*Myzus persicae*) or mechanically if carborundum abrasive is used. It is infective in 1:6,000 dilution but is inactivated by storage for 6 days at 11°–13° or by a 10-min. exposure to 60°–65°.

**Seedling stem blight of soybean caused by Glomerella glycines,** L. LING (*Phytopathology, 30 (1940), No. 4, pp. 345–347, fig. 1*).—In Szechwan Province, west China, soybeans are killed by anthracnose (*G. glycines*) before or soon after seedling emergence. The usual inoculum is mycelium within the seed or in the soil, and infected cotyledons become darkened by cankers that gradually spread to the hypocotyl and then rot the young stems. Inoculation of seeds or soil resulted in the death of 38–100 percent of seedlings in sterilized and 94–100 percent of those in nonsterilized soil. The conidia are short-lived and susceptible to drying. Asci have not yet been observed in Szechwan.

**Dusting or spraying for control of blight of the sugar beet,** H. C. YOUNG. (Ohio Expt. Sta.). (*Sugar Beet Jour., 5 (1940), No. 5, pp. 87–89, 92, figs. 3*).—General conclusions from the 1938–39 results on control of the *Cercospora* leaf blight indicate that it pays to spray or dust beets. In general, dusting gave slightly higher yields than spraying. The preparation and use of copper-lime dusts and bordeaux and the timing of applications are discussed.

**Sugar beet root rot caused by Rhizoctonia solani,** A. C. MAXSON (*Amer. Soc. Sugar Beet Technol., East. Slope and Intermount. Area, Proc., 1939, pp. 38–45*).—A general review (13 references) and summary of the present status of the disease with a list of hosts.

**Studies of frenching of tobacco with particular reference to thallium toxicity,** C. E. BORTNER and P. E. KARRAKER. (Ky. Expt. Sta.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 3, pp. 195–203, figs. 2*).—Previous studies (E. S. R., 71, p. 796) indicated that frenching of tobacco is related to the reaction or lime content of the soil and to the soil nutrient supply. In recent studies Tl addition caused chlorosis, 0.04 p. p. m. inducing it in Turkish tobacco seedlings in water cultures. Larger amounts were required in most sand cultures and much larger quantities in soil cultures. This Tl-induced chlorosis appeared in several forms, but all were, in several aspects, unlike field frenching. The latter starts in the interveinal tissue of the apical margin, while the Tl chlorosis appears in tissue at the leaf base and along the larger veins and, unlike frenching, may appear first in the larger leaves. Tl treatments failed to hasten frenching in soils subject to frenching, nor did they induce frenching in soils not subject to it. Liming and a low nutrient content did not increase Tl chlorosis, whereas these conditions tended to induce frenching. A much larger amount of Tl was required to cause chlorosis in soil cultures than presumably is ever present in soils where frenching occurs.

**Dissemination of tobacco mosaic in the field** [trans. title], K. SILBERSCHMIDT and M. KRAMER (*Arq. Inst. Biol.* [*São Paulo*], *10* (*1939*), *pp. 61–72, pl. 1, fig. 1; Ger. abs., pp. 70, 71*).—The field experiments reported indicated that a weeding out of spontaneously occurring solanaceous plants in the vicinity of tobacco fields is superfluous. However, in the plantings themselves the destruction of weeds is advised if they are largely solanaceous and especially if they are infected. In these studies flying insects apparently played only a subordinate role, since mosaic did not attack two healthy fields near the infected one.

**Reversible inhibition of tobacco mosaic virus in living cells with 0.0002 molar sodium cyanide,** M. W. WOODS. (Univ. Md.). (*Science, 91* (*1940*), *No. 2360, pp. 295, 296*).—Studies by a method described of living tobacco leaves inoculated with a single-lesion strain of severe mottling tobacco mosaic and of leaves of an $F_2$ necrotizing *Nicotiana* hybrid indicated that, with respect to ability to multiply in living cells, the virus responds to 0.0002 M sodium cyanide in much the same way as certain hematin-containing catalysts. This is taken to indicate that the virus mechanism either depends on the activity of hematin-containing respiratory catalysts of the cell or the virus protein itself may contain hematin or some similar structural unit that can be blocked reversibly by cyanide.

**Thermal denaturation of tobacco mosaic virus,** M. A. LAUFFER and W. C. PRICE (*Jour. Biol. Chem., 133* (*1940*), *No. 1, pp. 1–15, figs. 3*).—Termal denaturation of this virus was found to be readily reproduceable and to be a reaction of the first order. The energy of activation in 0.1 M phosphate buffer at pH 7 was calculated to be ±153,000 calories per mole. The reaction rate at a given temperature was strongly influenced by changes in pH, the reaction progressing faster in more alkaline and less rapidly in more acid solutions. The reaction rate varied inversely with the initial virus concentration, being about twice as great in systems with an initial concentration of 3 mg. per milliliter as in those initially at 6 mg. per milliliter. Thermal inactivation of the virus was found to proceed more rapidly than thermal denaturation measured by precipitation.

**Pests and diseases in the vegetable garden** ([*Gt. Brit.*] *Min. Agr. and Fisheries, "Growmore" Bul. 2* (*1940*), *pp II+26, pls. 4*).—This is an informational bulletin on the insect pests and diseases of bean varieties, beets, crucifers, carrots, parsnips, celery, lettuce, onions and leeks, peas, and potatoes. Brief sections on insecticides, fungicides, and apparatus are included.

**Certain injurious effects of spraying vegetables with the fixed coppers,** J. D. WILSON (*Ohio Sta. Bimo. Bul. 203* (*1940*), *pp. 36–43*).—During a search for bordeaux substitutes for such crops as tomatoes, cucumbers, and muskmelons, various examples of injury and their subsequent effects on yields have been observed. Though few, if any, of the fixed Cu compounds are as injurious to tomatoes as bordeaux, they nevertheless usually cause yield reductions unless leaf spot diseases are severe enough to cause considerable defoliation on the controls. Several of these preparations proved very injurious to carrots, in one test causing greater reductions in yield than bordeaux. In such cases, spraying can bring about net yield increases through disease control only after it has overcome or canceled this decrease due to spray injury. All spray materials tested during the last few years have reduced tomato yields whenever leaf spots have not been severe enough to cause considerable defoliation on controls. Bordeaux has usually caused more injury to tomatoes than the fixed Cu compounds, but many of the latter were found more injurious to lima and snap beans than bordeaux. Both types of fungicide used against bacterial wilt and leaf spots on muskmelons delayed ripening of many of the melons sufficiently to reduce both quality and price. Also, more green fruits were left on some of the treated plats, but this

effect was not sufficient to condemn the fixed Cu compounds, since the treated plats still produced more pounds of ripened fruits of good quality than the controls. Delay in tomato ripening due to sprays has been reported from various sources, but this may be beneficial to the canning industry because it tends to reduce the flow of tomatoes from the farms to the cannery during periods of heavy defoliation in untreated fields. The various types of injury observed are reported to call attention to what may be encountered, to show what crops are most susceptible, and to indicate the compounds most likely to cause injury, rather than to discourage the use of the fixed Cu preparations.

**Disease in mosaic resistant and non-resistant Green Refugee beans,** O. A. Reinking and C. G. Withiam. (N. Y. State Expt. Sta.). (*Canner, 90 (1940), No. 9, pp. 12–14, 28, fig. 1*).—This report on detailed records from commercial fields and replicated experimental plats indicated that the common bean mosaic nonresistant Stringless Green Refugee was outyielded by the resistant types, Idaho Refugee and U. S. No. 5, this being due at least in part to the presence of ± 100 percent of common bean mosaic and possibly to an inherent lower yielding capacity. The records for yellow mosaic, one-sided variegation, and bacterial blights are also discussed. With disease-free seed on noninfested soil not in beans for at least a year, severe bacterial infection apparently can be avoided.

**Host plants harboring Aplanobacter stewarti without showing external symptoms after inoculation by Chaetocnema pulicaria,** F. W. Poos. (U. S. D. A.). (*Jour. Econ. Ent., 32 (1939), No. 6, pp. 881, 882*).—Typical symptoms of bacterial wilt are reported to have been produced in susceptible sweet corn by inoculation with juice expressed from the following plants on which wilt-fed adults of the corn flea beetle *C. pulicaria* had fed: *Panicum dichotomiflorum, Coix lacryma-jobi, Poa pratensis, Dactylis glomerata, Agrostis alba, Sorghum vulgare sudanense, Triticum aestivum, Panicum capillare,* and *Setaria lutescens.* Although the experimental occurrence of symptomless host plants of the wilt organism, as here reported, does not indicate how significant they may be from the field standpoint, it is believed highly probable that they occur under field conditions and may have important relations to the incidence of wilt in corn. It is the author's purpose merely to call attention to the probable occurrence of symptomless hosts as another factor to be considered in explaining the inter- and intraseasonal varietions in wilt abundance and to the potential significance of such plants in furnishing wilt bacteria for the insect vectors to transmit to healthy corn plants.

**Little leaf—a transmissible disease of brinjal,** K. M. Thomas and C. S. Krishnaswami (*Indian Acad. Sci. Proc., 10 (1939), No. 2, Sect. B, pp. 201–212, pls. 2*).—A disease of brinjal (eggplant), observed to cause considerable damage in many parts of Madras, was found to be transmissible to *Datura fastuosa,* tomato, tobacco, and wild eggplants, *Solanum xanthocarpum* and *S. trilobatum.* The general nature of the symptoms and the absence of a visible associated organism suggested a virus etiology. The disease was easily transmitted by grafting but not by sap inoculation, and two jassid species appear to be vectors.

**A variety of brinjal (Solanum melongena Linn) resistant to bacterial wilt,** M. Park and M. Fernando (*Trop. Agr. [Ceylon], 94 (1940), No. 1, pp. 19–21, pls. 2*).—A variety of eggplant, the seeds of which were originally obtained from Matale South, is reported to have proved practically immune to *Bacillus* (=*Phytomonas*) *solanacearum* under a variety of test conditions. It is described and illustrated.

**Hop powdery mildew or "blue mold" may be very destructive,** R. O. Magie (*Farm Res. [New York State Sta.], 6 (1940), No. 2, pp. 9, 15, figs. 2*).—Sulfur dusts or sprays are said to have satisfactorily controlled the disease (the

sprays proving more effective) when coupled with certain cultural and sanitation measures, the most important of which is the destruction of overwintering perithecia found on diseased leaves and cones at harvest time. In a half-acre variety planting of untreated vines, most of them are reported to have been ruined, involving 88–100 percent of the cones of all native varieties. Two of the new English varieties appeared very resistant, but further studies are deemed necessary to establish the reactions of these and other new varieties.

**The use of chloropicrin as a seed treatment for black rot of kale,** T. J. NUGENT and H. T. COOK. (Va. Truck Expt. Sta.). (*Larvacide Log, 1 (1938), No. 4, pp. 114–119, figs. 4*).—Preliminary tests of seed treated in flasks indicated that the gas has fungicidal and bactericidal value as a seed treatment, and treatments at the different rates used caused very little injury to germination of seed containing 6.5 percent moisture even at 40° C. When the moisture content of the seed was increased the injury was greater.

**Distribution of manganese in the pea seed in relation to marsh spot,** H. H. GLASSCOCK and R. L. WAIN (*Jour. Agr. Sci. [England], 30 (1940), No. 1, pp. 132–140, fig. 1*).—The symptoms of this Mn-deficiency disease and the methods of analysis used in this study are described. As no loss of Mn was found to result from soaking the peas in water for 24 hr., soaked peas were used for dissection. In the affected peas the highest Mn level occurred in the peripheral cotyledon tissues, followed by the germ and seed coat. Only slight traces were found in the healthy and in the necrotic tissues from the center of the cotyledon. All parts of healthy seeds were richer in Mn than comparable diseased samples, and in addition the order of distribution differed. A given weight of small peas contained less Mn than the same weight of large peas selected from the same diseased lot, while the reverse was true for healthy peas. Thus, peas of uniform size should be selected for analysis when the relative Mn levels of different lots are to be tested. It is suggested that migration of cell contents from the necrotic tissue of diseased peas may account in part for the differences in Mn content of healthy v. diseased peas.

**Important tomato diseases in New Jersey in 1939,** E. K. VAUGHAN. (U. S. D. A.). (*N. J. State Hort. Soc. News, 21 (1940), No. 2, pp. 1191, 1199*).

**Results of tomato seedling disease investigations in Georgia, 1937–1938,** W. D. MOORE. (U. S. D. A. coop. Ga. and Ga. Coastal Plain Expt. Stas. et al.). (*Canning Age, 21 (1940), No. 3, pp. 124, 140, fig. 1*).—A brief progress report, with particular reference to spore trap studies, indicating dissemination of early blight (*Macrosporium=Alternaria solani*) spores almost throughout the year, the direct influence of weather conditions on the development of both leaf spot and stem canker, injury by bordeaux sprays and tentative recommendations of substitutes, date and rate of seeding relative to diseases and markets, and the importance of care in packing and handling tomato seedling plants for shipment.

**Differences in growth characters and pathogenicity of Fusarium wilt isolations tested on three tomato varieties,** F. L. WELLMAN and D. J. BLAISDELL (*U. S. Dept. Agr., Tech. Bul. 705 (1940), pp. 29, figs. 7*).—In studies of 30 random cultures from diverse regions of the United States, all produced tomato wilt and, except one, were *F. bulbigenum lycopersici*. All isolates of the latter, except one, were grouped into 5 types based on dissimilar growth characters, correlated with distinct variations in pathogenicity. Tested on Bonny Best, Marglobe, and Red Currant tomatoes, cultures characterized by raised light-colored mycelium proved most virulent, raised types with sclerotialike bodies were erratic and on the whole slightly less pathogenic, those of intermediate-raised type produced less disease than the two raised types, those of an

intermediate-appressed type with scanty mycelium over a dark appressed growth were weaker than the other groups, and the dark-colored, completely appressed cultures with no aerial mycelium were the least virulent of all. Saltation occurred in all groups, was least noticeable in fully raised and completely appressed cultures, most conspicuous and frequent in raised sclerotial, and intermediate in occurrence in the intermediate groups. Saltants tested were generally less virulent than the parent cultures. There were also marked divergencies in pathogenicity on the three tomato varieties, due to differences in relative resistance. The wilt-resistant Red Currant was in most cases practically unaffected, the wilt-tolerant Marglobe was severely diseased by the most virulent cultures but was distinctly resistant to less pathogenic types, and the wilt-susceptible Bonny Best was severely diseased by all cultures except the least virulent. There are 27 references.

**Tomato fruit pox,** S. S. Ivanoff and P. A. Young. (Tex. Expt. Sta.). (*Phytopathology, 30 (1940), No. 4, pp. 343–345, fig. 1*).—An economically important abnormality of green and ripe tomatoes was observed in southwestern Texas during five spring and fall seasons (1937–39), the first sign on green fruits of all ages consisting of many conspicuous, abnormally dark green, small dots scattered over the surface of the fruit and giving it a mottled appearance. Sometimes the spots coalesce to form a streak, usually with the long axis meridionally oriented. Later these dots become sunken with ruptured surface, as pits or "pox," whence the name of the disease. On ripe fruits the pox may cork over and resemble an abnormally large lenticel. In some fields ±90 percent of the plants were affected, with over 10 percent of the fruits unmarketable. Affected fruits were found on the markets from Florida, Texas, Mexico, Puerto Rico, and Cuba. Many common varieties were found subject to the trouble, Pritchard and Stokesdale being most frequently attacked. No micro-organisms have been isolated from affected tissues, and the cause is as yet unknown.

**Mechanical transmission of yellow-spot virus: Evidence for identity with spotted-wilt virus,** G. K. Parris. (Hawaii Expt. Sta.). (*Phytopathology, 30 (1940), No. 4, pp. 299–312, figs. 8*).—The author describes a tomato disease in Hawaii with symptoms like those of spotted wilt and presents evidence that it is caused by the pineapple yellow spot virus. It was easily transmitted mechanically from tomato to tomato and potato and from *Emilia sonchifolia* to *Emilia* and tomato and by grafting from tomato to tomato and potato and from potato to tomato. The virus is apparently not seed-transmissible but was easily recoverable from immature, but not from mature, diseased tomato fruits. This virus is believed to be identical with that of spotted wilt, but as yet the physical properties have not been compared.

**A soft rot of apples caused by Trichoseptoria fructigena,** M. C. Richards. (Cornell Univ.). (*Phytopathology, 30 (1940), No. 4, pp. 328–334, figs. 3*).—A soft rot of McIntosh apples was shown to be due to a fungus isolated in pure culture from diseased fruits and identified as *T. fructigena*. Its pathogenicity was successfully tested on the fruits of 25 apple varieties, and the pathogen and disease symptoms induced were studied and are described. The optimum for vegetative growth proved to be ±21° C., while that for pycnidial formation was somewhat lower. The effect of temperature and relative humidity on the type of pycnidia produced is discussed. Both conidia and infected fruit tissues may serve as inocula.

**A transmissible leaf-casting yellows of peach,** H. Earl Thomas, T. E. Rawlins, and K. G. Parker. (Univ. Calif.). (*Phytopathology, 30 (1940), No. 4, pp. 322–328, figs. 2*).—A graft-transmissible leaf-casting yellows disease

of peach, established in several counties of central California, is said to be similar to, if not identical with, peach diseases in other areas, including the "X" disease of the Northeastern States. There is evidence also that it may be due to the same virus as the buckskin disease of sweet cherry, *Prunus avium*. Observation of marked branches and grafting tests indicated that the virus usually is not completely systemic and is not always present in branches known to have been affected previously. Roots were apparently somewhat less effective than tops as sources of the virus.

**Latest facts about the "X" disease of the peach,** R. H. DAINES (*N. J. State Hort. Soc. News, 21 (1940), No. 2, pp. 1193, 1198, fig. 1*).—A brief summary on the present distribution and status of knowledge of this virus disease, including the importance of removing the chokecherry host.

**A leaf spot of Italian Prune perpetuated in budded stock,** E. C. BLODGETT. (Univ. Idaho). (*Phytopathology, 30 (1940), No. 4, pp. 347, 348, fig. 1*).—A leaf spot accompanied by defoliation is reported a serious trouble in Idaho orchards of Italian Prune. When healthy J. H. Hale and Elberta peach trees were budded from affected trees, shoots with typical leaf symptoms were produced, but the accompanying peach shoots were normal. While it is believed from this preliminary study that environal factors are important, the trouble appears to be due either to a virosis or to a genetic abnormality.

**Experiments in breeding cranberries for false blossom control,** H. F. BAIN. (U. S. D. A.). (*Cranberries, 4 (1940), No. 11, pp. 9–11*).—The history of this virus disease, spread by the cranberry leafhopper, is briefly reviewed, and progress is reported in the breeding of resistant cranberry varieties, including a list of all the crosses made up to the present time.

**A note on the resistance of Azalea plants to fumigation with methyl bromide** [trans. title], J. LOUNSKY (*Bul. Inst. Agron. et Stas. Rech. Gembloux, 8 (1939), No. 2, pp. 126–131; Dutch, Ger., Eng. abs., p. 131*).—Azalea plants of different varieties were fumigated in vacuo with methyl bromide at the rate of 40 and 80 gm. per cubic meter for 2 hr. On the whole, the treatments had no injurious effects, and the plants continued to grow and flower normally.

**Alternaria branch rot on carnation cuttings: Effect of treatments,** R. S. KIRBY. (Pa. State Col.). (*Florists Exch. and Hort. Trade World, 94 (1940), No. 1, p. 11*).—A progress report on promising results through treatment of cuttings with potassium permanganate or NA Dust, alone or in combination.

**The status of Cylindrosporium chrysanthemi E. and D., as the causative agent of chrysanthemum leaf blight,** J. A. TRENT (*Kans. Acad. Sci. Trans., 42 (1939), pp. 203–205, figs. 5*).—It is concluded that *C. chrysanthemi* has more characteristics in common with *Septoria* than with *Cylindrosporium* and should be considered a synonym of *S. chrysanthemi*.

**Cercospora leafspot of red bud,** F. A. WOLF (*Mycologia, 32 (1940), No. 2, pp. 129–136, figs. 11*).—Studying the developmental cycle of the fungus generally known as *C. cercidicola*, causing leaf spot in redbud (*Cercis canadensis*), the author found that there is also a perithecial stage, *Mycosphaerella cercidicola* n. comb. The conidial stage is parasitic. The spermagonia and carpogonia that initiate the perithecia are developed in the late summer and early fall, and the perithecia mature on decaying leaves the following spring.

**A new species of Taphrina on alder,** W. W. RAY. (Okla. A. and M. Col.). (*Mycologia, 32 (1940), No. 2, pp. 155–158, figs. 2*).—*T. macrophylla* n. sp. and the leaf disease which it causes on *Alnus rubra* are described, and the fungus is compared with *T. japonica*. This host is said to be affected by three distinct species of *Taphrina*.

**The chestnut blight and its relation to the principle of disease resistance,** A. P. KELLEY (*Science, 91 (1940), No. 2360, pp. 290, 291*).—The author conjectures that apparent resistance of some seedlings may be due to "phagocytosis" of the fungus in host tissue of higher osmotic pressure.

**The Dutch elm disease, elm bark beetles, and their control,** J. J. FRANSEN (*Iepenziekte, iepenspintkevers en beider bestrijding. Proefschr., Landb. Hoogesch., Wageningen, [1939], pp. [8]+118, figs. 3; Eng. abs., pp. 105–112*).—This dissertation considers the transmission of *Ceratostomella ulmi* by *Scolytus scolytus* and *S. multistriatus*, the feeding period, generations, and habits of these insects, and the control of the elm disease. There are over 5 pages of references.

**Factors affecting Dutch elm disease spread,** E. P. FELT (*Sci. Tree Topics, 1 (1940), No. 3, pp. 18–22, figs. 4*).—The author briefly discusses the present and future situation regarding this disease and its control, and presents data on insects and wind drift as important agencies in its spread.

**Diseases of trees: Symptoms described of two different types of cankers recently reported on maples,** L. R. TEHON (*Amer. Nurseryman, 71 (1940), No. 4, pp. 18, 19*).—Basal and bleeding cankers are considered.

**Dasyscyphae on conifers in North America.—IV, Two new species on Douglas fir from the Pacific coast,** G. G. HAHN. (U. S. D. A. et al.). (*Mycologia, 32 (1940), No. 2, pp. 137–147, figs. 2*).—*D. pseudotsugae* and *D. ciliata* are described and illustrated.

**Diseases of trees: New information on Sphaeropsis dieback and needle blights of pines,** L. R. TEHON (*Amer. Nurseryman, 71 (1940), No. 5, pp. 24, 25, 29*).—Brief notes are presented on the symptoms, distribution, hosts, and control of these diseases. It is indicated that the spotting and blighting of needles of Austrian and other pines in the Northern States is due to a different fungus from the *Septoria* needle blight or brown spot of longleaf pines in the Southern and Southeastern States.

**Witches'-broom,** M. E. FOWLER (*Amer. Forests, 45 (1939), No. 10, p. 518, fig. 1*).—An illustrated note on witches'-broom (cause undetermined) on Virginia pine, thought to be the first report for this host.

## ECONOMIC ZOOLOGY—ENTOMOLOGY

**The philosophy of biological nomenclature,** J. C. BRADLEY (*7. Internatl. Kong. Ent., Berlin, 1938, I, Verhandl., pp. 531–534*).

**North American big game,** reviewed by S. P. YOUNG (*Jour. Mammal., 21 (1940), No. 1, pp. 96–98*).—This review of the work noted (E. S. R., 82, p. 352) calls attention to errors contained in the part relating to vanished game.

**A study of the range habits of elk on the Selway Game Preserve,** V. A. YOUNG and W. L. ROBINETTE. (U. S. D. A.). (*Idaho Univ. School Forestry Bul. 9 (1939), pp. [1]+48, figs. 3*).

**Fur-bearers and game mammals of Iowa,** E. A. HICKS and G. O. HENDRICKSON (*Iowa Sta. Bul. P3, n. ser. (1940), pp. 113–147, figs. 11*).—Brief accounts are given of the fur-bearing and game mammals of the State, some 16 in number, together with notes on the care and handling of furs and traps and trappings and a glossary of terms used in the fur trade.

**Migrations of New England bats,** D. R. GRIFFIN (*Bul. Mus. Compar. Zool., 86 (1940), No. 6, pp. [1]+217–246, pls. 5, figs. 3*).—This contribution is presented with a list of 66 references to the literature.

**Attracting birds,** W. L. MCATEE (*U. S. Dept. Int., Bur. Biol. Survey, Conserv. Bul. 1 (1940), pp. [4]+15, figs. 13*).—This practical contribution is said to

supersede U. S. D. A. Farmers' Bulletins 621, 760, 844, and 912 (E. S. R., 32, p. 347; 36, p. 151; 38 pp. 53, 556), each of which dealt with a definite region of the United States.

**The ringnecked pheasant: Fall and winter feeding habits in southeastern North Dakota**, J. A. Munro and S. Saugstad (*North Dakota Sta. Bimo. Bul., 2 (1940), No. 4, pp. 7, 8*).—The results of studies of the feeding habits of the ring-necked pheasant during the hunting season in the fall of 1936 and 1938 and during the winter of 1937 are reported upon. The data brought together in tables show the frequency of occurrence of the different food items found in the crops and gizzards of the pheasants, the comparative amounts of the principal foods of the pheasants taken in the fall of 1938 as based on dry weight of crop and gizzard contents, and the maximum findings for individual birds. It is concluded that the feeding habits of this fowl in the southeastern part of the State, as shown by the period under study, are beneficial to agriculture. While a large proportion of its diet is composed of waste grains, the balance includes many items such as insects and weed seeds that are distinctly objectionable to the farmer.

**The starling's family life and behaviors**, H. A. Allard (*Jour. Wash. Acad. Sci., 30 (1940), No. 1, pp. 34-46, figs. 4*).—Intensive observations of the life habits of *Sturnus vulgaris* indicate a very high order of bird intelligence.

**The burrowing owl as a host to the argasid tick Ornithodoros parkeri**, W. L. Jellison (*Pub. Health Rpts. [U. S.], 55 (1940), No. 5, pp. 206-208*).—The author found that the burrowing owl (*Speotyto cunicularia*), the only species of raptorial bird that nests in burrows, harbors large numbers of *O. parkeri*. It was also found that other ectoparasites, especially fleas from small mammals that have been carried to the nests for food, are trapped in the burrows and can be readily collected. Burrows infested with this tick were found in Franklin, Douglas, Yakima, and Okanogan Counties, Wash. The heavy burrow infestations and the finding of avian red cells in the intestinal contents of the ticks indicate that the burrowing owl is an important host in the Northwest.

**A laboratory guide in entomology**, R. Matheson (*Ithaca, N. Y.: Comstock Pub. Co., 1939, pp. VII+135, [figs.] 48*).—The classification and biology of insects constitute the main part of this work which is presented in 28 parts, an appendix, and a glossary.

**[Contributions on economic insects, insecticides, and insect control]** (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1939, E-484, pp. 6; E-485, pp. 7, pls. 7; E-486, pp. 8, pl. 1; E-487, pp. 12, pl. 1; E-488, pp. 10, pls. 6; E-489, pp. 4; E-490, pp. 4; E-491, pp. 9, pls. 4; E-492, pp. 2; E-493, pp. 40; E-494, pp. 57; E-495, pp. 11, pls. 3*).—The following contributions are in continuation of this series (E. S. R., 81, p. 805): The Use of Methyl Bromide for the Treatment of Quarantined Plant Products, by L. A. Hawkins (E-484); Control of the Earworm in Sweet Corn by Fumigation, by G. W. Barber (E-485); White Grubs in Forest Nurseries of the Carolinas, by H. R. Johnston and C. B. Eaton (E-486); Report on a Survey in South America of the White-Fringed Beetle [*Naupactus leucoloma* Boh.] and Its Natural Enemies, by P. A. Berry (E-487); The Laboratory-Field Method for Testing Codling Moth Insecticides, by L. F. Steiner (E-488); Suggestions for the Control of the Tomato Fruitworm [Corn Earworm], by W. H. White (E-489), which supersedes E-423 (E. S. R., 79, p. 358); Control of the Gladiolus Thrips on Corms During Storage, by C. A. Weigel and R. H. Nelson (E-490); A Field Method for the Chemical Evaluation of Spray Deposits Resulting From the Application of Insecticides for Control of the Codling Moth, by J. E. Fahey and H. W. Rusk (E-491); Fumigation of Vetch Seed to Control the Vetch Bruchid, by L. A. Hawkins (E-492); A Bibliography

of Cyanide Compounds Used as Insecticides, 1933, by H. D. Young (E-493); A Bibliography of Cyanide Compounds Used as Insecticides, 1934, by H. D. Young and R. L. Busbey (E-494); and Brief Presentation of the Characteristics, Contaminants, Processing, and Uses of Beeswax, by G. H. Vansell and C. S. Bisson (E-495) (Calif. Expt. Sta.).

**The eighth annual insect population summary of Kansas, covering the year 1938,** R. C. Smith and E. G. Kelly. (Kans. Expt. Sta.). (*Kans. Acad. Sci. Trans., 42 (1939), pp. 303–323, fig. 1*).—A continuation of this annual insect population summary (E. S. R., 80, p. 70), covering the eighth year of the drought cycle commencing in 1931.

**[Work in economic entomology by the Missouri Station]** (*Missouri Sta. Bul. 413 (1940), pp. 59–62, 79, 80*).—Reference is made to the occurrence of and control work of the year (E. S. R., 78, p. 219) with the chinch bug, grasshopper, armyworm, codling moth, hessian fly, strawberry insects, and insect pests of melon and related crops, all by L. Haseman; the tolerance of the codling moth to the toxic action of insecticides, by Haseman and H. E. Brown; codling moth control investigations, by Haseman, L. Jenkins, and C. S. Harris; and substitutes for arsenical sprays, by H. G. Swartwout and C. G. Vinson.

**[Work in economic entomology by the Washington Station]** (*Washington Sta. Bul. 384 (1939), pp. 25, 26, 33–36, 81, 83, 84, 85*).—The work of the year (E. S. R., 81, p. 239) reported upon includes the chemistry of oil sprays, by K. Groves and J. L. St. John; sprays for codling moth control, by Groves and H. Fallscheer; factors influencing the selection of mineral oil sprays for insecticides, the possibilities of replacing lead arsenate by insecticides nonpoisonous to man, the control of five species of orchard spider mites affecting fruit trees in irrigated regions of eastern Washington, and comparison of insecticidal values of dry and liquid lime-sulfur, all by R. L. Webster and J. B. Moore; life history and control of the cherry fruitworm in western Washington, by E. P. Breakey and Webster; the discovery of pear psylla in Washington, by Webster; the influence of alfalfa on the abundance of the pea aphid in canning peas and tomato fruitworm control, both by Webster and R. D. Eichmann; and the onion thrips as a pest of greenhouse carnations, by Eichmann. Work at the Irrigation Substation consisted of wireworm investigations, by M. C. Lane, R. S. Lehman, and K. E. Gibson (coop. U. S. D. A.). Work at the Tree Fruit Substation, by F. L. Overley, included photosynthetic studies with oils used in the spray program, and at the Cranberry-Blueberry Substation, by D. J. Crowley, dormant spray tests and control of the black vine weevil, fireworm, and fruitworm.

**[Report of work with economic insects in western Washington]** (*Western Washington Sta. Rpt. 1939, pp. 19–25*).—Reference is made to the work of the year (E. S. R., 81, p. 391) on the life history and control of the cherry fruitworm in western Washington, by E. P. Breakey and R. L. Webster; holly insects and their control, the effect of the solvent on rotenone in solution, and the strawberry root weevil, all by Breakey; the resistance of plants to corn earworm attack, by Breakey, M. S. Grunder, and K. Baur; control of the pear thrips in prune orchards, by Breakey, G. A. Huber, and Baur; and pyrethrum as a crop for western Washington, by Grunder and Breakey.

**The identification of soil insects by their burrow characteristics,** H. R. Bryson. (Kans. Expt. Sta.). (*Kans. Acad. Sci. Trans., 42 (1939), pp. 245–253, figs. 9*).

**[Apple sprays],** F. Z. Hartzell (*Farm Res. [New York State Sta.], 6 (1940), No. 2, pp. 1, 5, 12*).—This discussion of insecticides and their value in combating apple insects includes recommended mixtures for early spring treatments for major pests with various materials and notes on the choice of mixtures.

**Contribution to the biology and control of important pests of oil-producing plants: The biology and control of Ceuthorrhynchus assimilis Payk. and Meligethes aeneus Fbr.** [trans. title], H. A. von Weiss (*Monog. Angew. Ent., No. 14 (1940), pp. 131, figs. 54*).—The biology of the cabbage or turnip weevil *C. assimilis* and its importance is first considered, followed by an account of the importance of the turnip blossom or rape beetle *M. aeneus*, and by means for their control. A bibliography of 126 titles is included.

**Control practice for diseases and pests of ornamental plants,** H. Pape (*Die Praxis der Bekämpfung von Krankheiten und Schädlingen der Zierpflanzen. Berlin: Paul Parey, 1939, 3. ed., rev., pp. VIII+475, pls. 8, figs. 336*).—A new and enlarged edition of this work of which the second has been noted (E. S. R., 76, p. 817).

**Orchid insects,** D. T. Fullaway (*Hawaii. Ent. Soc. Proc., 10 (1938), No. 1, pp. 45–49*).

**[Contributions on shade tree insects]** (*East. Shade Tree Conf., New York, 1938, Proc., pp. 24–29, 39–58, pl. 1, fig. 1*).—Contributions relating to shade tree insects and their control, presented at the Eastern Shade Tree Conference held in New York in December 1938, include the following: Storm Damage in Vermont and the Forest Tent Caterpillar, by H. L. Bailey (pp. 24–29); The Relation of Insect Work to Hurricane Damage, by S. W. Bromley (pp. 39–46); The Japanese Beetle as a Shade Tree Pest and Its Control in the East, by C. H. Hadley (pp. 47–49) (U. S. D. A.); The [European] Spruce Sawfly (*Diprion polytomum* Htg.) and the European Pine Shoot Moth (*Rhyacionia buoliana* Schiff.), by R. B. Friend (pp. 50–53) (Conn. [New Haven] Expt. Sta.); and The Gypsy Moth as It Approaches the Barrier Zone, by A. F. Burgess (pp. 53–58) (U. S. D. A.).

**Forest insects of Sweden,** I. Trägårdh (*Sveriges Skogsinsekter. Stockholm: Hugo Gebers, 1939, 2. ed., rev. and enl., pp. XII+509, figs. [327]*).—A revised and enlarged edition of this work (E. S. R., 35, p. 254).

**A check-list of the ectoparasites of the domesticated animals in Burma,** J. Bhattacharjee (*Indian Jour. Vet. Sci. and Anim. Husb., 9 (1939), No. 4, pp. 437–442*).—A systematically arranged list of the ectoparasites of domesticated animals in Burma.

**The possibilities of cattle fly sprays in India,** S. K. Sen (*Indian Jour. Vet. Sci. and Anim. Husb., 9 (1939), No. 4, p. 339–348, figs. 2*).—A spray consisting of high speed Diesel oil, Pyrocide 20 (a concentrated extract of pyrethrum flowers), and pine oil when applied on Sahiwal cows for 21 consecutive days was very effective against *Musca crassirostris* and *Lyperosia exigua*, at the time the two prevalent species of biting flies on the farm, and did not produce any burning or scurfing of the skin.

**Human helminthology: A manual for physicians, sanitarians, and medical zoologists,** E. C. Faust (*Philadelphia: Lea & Febiger, 1939, 2. ed., rev., pp. 780, figs. 302*).—A thoroughly revised edition of this work (E. S. R., 64, p. 174) in which a chapter on anthelmintics and their use has been added.

**The place of cryolite in fruit pest control,** S. Marcovitch. (Tenn. Expt. Sta.). (*Amer. Fruit Grower, 60 (1940), No. 2, pp. 14, 22, 26, figs. 2*).

**Results of some experiments with "dinitro" and related sprays used last winter,** W. S. Hough. (Va. Expt. Sta.). (*Va. State Hort. Soc. Rpt., 44 (1939), pp. 180–182*).—The results of orchard experiments for control of the rosy apple aphid, green aphid, and scurfy scale are reported, the details being given in tables. No conclusions are drawn from the single season of tests in which some of the materials were used for the first time.

**Distribution of nicotine between water and petroleum oils,** L. B. NORTON (N. Y. State Expt. Sta.). (*Indus. and Engin. Chem., 32 (1940), No. 2, pp. 241–244, figs. 3*).—It is pointed out that nicotine is nearly equally distributed between petroleum oils and water at low concentrations, and that the distribution in favor of the water increases with intermediate concentrations, reaches a maximum, and decreases at high concentration. "Acids extract the nicotine completely into the water phase when present in excess and hold an equivalent amount in the water when in smaller amounts. The excess free base is thus left equally distributed between the phases. Alkalies have no appreciable effect in concentrations less than 0.1 normal. In higher amounts they drive the nicotine into the oil phase, the extraction into the oil being complete with 5 N sodium hydroxide. It is concluded that only that portion of the nicotine which is in the free state will be shared with the oil, that the nicotine will be distributed in approximately equal concentrations in the oil and the water in the original spray mixture regardless of the concentration of the nicotine and of the presence of fungicides and emulsifiers, and that some of the nicotine originally in the water will be transferred to the oil if the spray dried on the foliage."

**Early spring sprays,** F. Z. HARTZELL. (N. Y. State Expt. Sta.). (*Amer. Fruit Grower, 60 (1940), No. 2, pp. 9, 38, 39, figs. 5*).

**The spray residue tolerances,** W. A. RUTH. (Univ. Ill.). (*Amer. Pomol. Soc. Proc., 54 (1938), pp. 139–147*).—A discussion, presented with 18 references to the literature.

**Remarks on the geographical distribution of North American Collembola,** H. B. MILLS. (Mont. Expt. Sta.). (*Bul. Brooklyn Ent. Soc., 34 (1939), No. 3, pp. 158–161*).

**Notes on the variegated grasshopper Zonocerus variegatus L. in Nigeria,** F. D. GOLDING (*Bul. Ent. Res., 30 (1940), No. 4, pp. 543–550*).

**The rate of regeneration in the German [cock]roach,** L. C. WOODRUFF and L. SEAMANS (*Ann. Ent. Soc. Amer., 32 (1939), No. 3, pp. 589–599*).

**The egg content and nymphal production and emergence in oothecae of two introduced species of Asiatic mantids (Orthoptera: Mantidae),** H. FOX (*Ann. Ent. Soc. Amer., 32 (1939), No. 3, pp. 549–560*).—Observations of the egg contents of oothecae of the Chinese mantis and of *Tenodera angustipennis* Sauss., collected in the Bronx section of New York City and at Ocean View, N. J., are reported. Details regarding the number of eggs in oothecae of *Tenodera*, frequency distribution of variations in egg content of oothecae of *Tenodera*, correlation between size of ootheca and number of eggs in *Tenodera*, and nymphal production and emergence in oothecae of *Tenodera* are given in tables.

**Tartar emetic for control of citrus thrips on lemons,** A. M. BOYCE. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 25 (1940), No. 4, p 100*).—A brief summary is given of a discussion which reports favorable results from the application of tartar emetic used during the season on 400 plats scattered in the San Fernando, Claremont, Upland, Corona, and Whittier areas. Parallel trials of tartar emetic, used at 1 lb. per 100 gal. of water plus 2 lb. of cane or beet sugar showed it to be superior to sulfur dust or lime-sulfur sprays. No injury resulted from the use of tartar emetic either to fruit or foliage, and thus far the grade of the fruit has not been reduced any more than would have resulted from the citrus thrips scarring that was present at the time the tartar emetic application was applied. Extensive studies have shown that the use of this insecticide on citrus is not likely to lead to any residue problem.

**Field studies on control of citrus thrips on lemon and oranges,** C. O. PERSING, A. M. BOYCE, and F. G. MCCARTY. (Calif. Citrus Expt. Sta.). (*Calif.*

*Citrog., 25 (1940), Nos. 5, pp. 134, 170–172, figs. 2; 6, pp. 176, 177, 204–206, fig. 1)*.—A review of the citrus thrips problem is followed by a report on the progress of control work (see above) with contact and stomach insecticides conducted by the authors in which tartar emetic was found to be the most effective of the stomach poisons. The details of the comparison made of tartar emetic, Antimonelle (a proprietary product in which the active ingredient is calcium antimonyl tartrate), and lime-sulfur sprays and of various concentrations of tartar emetic and sugar in sprays and dusts, all on Eureka lemons, are reported in tables. There was no significant difference in the effectiveness of sprays containing 1, 2, 4, or 8 lb. of sugar per 100 gal. with 2 lb. of tartar emetic 40 days as well as 65 days following treatment. Forty days after treatment there was very little difference in the effectiveness of 1, 2, or 4 lb. of tartar emetic per 100 gal., but the 0.5-lb. concentration was less effective. Sixty-five days after treatment there was a greater segregation of dosages in relation to control, the 2- and 4-lb. concentrations maintaining an effectiveness of approximately 80 percent, while the 1-lb. concentration had dropped to about 44 percent and 0.5-lb. concentration to about 17 percent.

The development of an efficient method of applying tartar emetic has been a problem of major importance, and various dust combinations of this material were studied in order to determine the effectiveness and practicability of applying it in this form. The first of the two methods of mixing studied consisted in atomizing a water solution of tartar emetic and sugar onto an inert diluent, such as talc or walnut-shell flour. The second method of mixing consisted in grinding tartar emetic with sugar and diluent, all as dry powdered solids, in a ball mill. In several field tests tartar emetic dusts prepared by the latter, or "dry mix," method were found to be superior to those prepared by the former method, and the dry mix method was used for preparing the dusts that were compared in the field with certain tartar emetic sprays. In a comparison made in which approximately 1 lb. of dust at strengths of 10 percent of tartar emetic with 10 percent sugar and 20 percent of tartar emetic with 20 percent sugar was applied to each large tree there was little difference in the effectiveness 40 days later, but after 65 days the effectiveness of 10 percent dusts was found to be greatly inferior to that of the 20 percent dusts. As regards residues, it is stated that from field plats receiving as many as five sprays of tartar emetic at a concentration of 4 lb. per 100 gal. no difficulty was encountered in their removal to a safe level by ordinary packing house washing procedure.

**Thysanoptera of Kauai, with notes on the incidence of yellow spot on wild host plants,** K. Sakimura. (Hawaii. Pineapple Prod. Expt. Sta.). (*Hawaii. Ent. Soc. Proc., 10 (1938), No. 1, pp. 167–173, fig. 1*).—Report is made of 16 species of thrips collected from Kauai, 13 of which were hitherto unrecorded from that island or are new species. A host plant list is included.

**Observations on three species of Triatoma (Hemiptera: Reduviidae),** L. P. Wehrle. (Univ. Ariz.). (*Bul. Brooklyn Ent. Soc., 34 (1939), No. 3, pp. 145–154, fig. 1*).—This contribution relates to three species of assassin bugs that occur in the Tucson area of Arizona, namely, *T. protracta* Uhler, *T. uhleri* Neiva, and *T. longipes* Barber.

**Resistance of $F_1$ sorghum hybrids to the chinch bug,** R. G. Dahms and J. H. Martin. (Okla. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 2, pp. 141–147, fig. 1*).—In the work reported, the details of which are given in tables, the determination of the inheritance of chinch bug resistance in sorghums through measuring the injury to the plants was found impossible because of the frequent occurrence of hybrid vigor that enables the plants to escape serious injury. "Chinch bugs confined on the stems of field-grown plants

of susceptible sorghum varieties by means of small celluloid cages laid more eggs than those similarly confined on resistant varieties. Egg counts thus obtained offer a method for determining the genetics of resistance to chinch bug injury and for indicating in the $F_1$ generation which crosses offer the greatest promise in breeding for resistance. When this criterion was used to measure chinch bug resistance the data from 11 sorghum hybrids in the $F_1$ generation and their parents indicate that in most of the crosses resistance was dominant to susceptibility. The extent of hybrid vigor as measured by height of plant, diameter of stalk, and number of tillers did not appear to be definitely associated with chinch bug resistance as measured by oviposition and longevity of the females. In general, chinch bug females lived longer on the susceptible varieties, but the difference was small and the duration of life is a poorer criterion for measuring chinch bug resistance than is the number of eggs laid."

**Carbon disulphide and dichlorethyl ether as soil fumigants for the woolly [apple] aphid (Eriosoma lanigerum Hausm.)**, G. W. UNDERHILL and J. A. COX. (Va. Expt. Sta.). (*Va. Fruit, 28 (1940), No. 2, pp. 20, 22, 24, 26*).—The results of cage tests and orchard experiments, the details of which are given in table form, indicate "that either carbon disulfide emulsion 1 : 1600 or dichloroethyl ether in solution 1 : 800 when applied at the rate of 1 gal. to the square foot of soil area gave satisfactory control of the woolly apple aphid and did not cause any perceptible injury to the roots of apple. However, carbon disulfide when applied at the above dilutions and at the rate of 2 and 3 gal. to the square foot of soil area burned the roots and in some experiments killed the trees. The results of the experiments indicate that 1 gal. of either carbon disulfide emulsion or dichloroethyl ether in solution gave a more satisfactory control than did 0.5 gal. of the liquids."

**The developmental history of germaria in parthenogenetic female aphids**, C. A. LAWSON (*Ohio Jour. Sci., 40 (1940), No. 2, pp. 74–81, figs. 3*).—A description is given of the developmental history of the germaria in parthenogenetic female aphids, commencing with the appearance of the germarial cells in the blastula.

**The Comstock mealybug on apples**, W. J. SCHOENE. (Va. Expt. Sta.). (*Va. State Hort. Soc. Rpt., 44 (1939), pp. 155–159, fig. 1*).—This contribution, presented at the Roanoke meeting of the Virginia State Horticultural Society in December 1939, reports upon the present knowledge of the Comstock mealybug *Pseudococcus comstocki*. Investigations were commenced in 1934 immediately following an outbreak of the pest in the apple orchards of the State, in which, mainly in the high-producing orchards, it has become a pest. The important injury is the dense black coating of sooty fungus which appears on the upper surface of the apple. This fungus grows in the accumulation of honeydew which drops from the bodies of the mealybugs, and while its presence does not affect the quality of the apple as food, it spoils the appearance of the apple and no means has yet been found to remove it. When the mealybugs are numerous there is usually a heavy drop of the foliage due to their feeding on the leaves and twigs. The fruits frequently crack owing to the combined action of the coating of honeydew and sooty fungus, and in severe infestations the entire crop may be disposed of only as cull apples. Although numerous attempts have been made to control the pest by applications of nicotine alone and in combination with oil, no spray has been found that can be depended upon to destroy it when present in large numbers. The damage in 1939 was most severe in orchards in which a full spray program had been applied and which had received applications of nitrate or other fertilizer. The present indications are that slight adjustments in orchard management may result in a decrease in the mealybug injury.

**Biological control of the long-tail mealybug on citrus and avocado,** S. E. FLANDERS. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 25 (1940), No. 5, pp. 146, 154, 155, figs. 3*).—A review is given of the progress and present status of control work with the long-tailed mealybug, known to exist on citrus in southern California for many years and which suddenly assumed outbreak proportions in 1933.

**Butterflies of New Jersey: A list of the Lepidoptera suborder Rhopalocera occurring in the State of New Jersey, giving time of flight, food plants, [and] records of capture with locality and date,** W. P. COMSTOCK (*Jour. N. Y. Ent. Soc., 48 (1940), No. 1, pp. 47–84*).

**The migrations of the cabbage white butterfly Pieris brassicae,** C. B. WILLIAMS (*7. Internatl. Kong. Ent., Berlin, 1938, I, Verhandl., pp. 482–493, figs. 5*).

**Bionomics of a grape boring plume moth, Oxyptilus regulus Meyr., in South India,** T. V. SUBRAMANIAM (*Bul. Ent. Res., 30 (1940), No. 4, pp. 471–473, pl. 1, fig. 1*).

**On the distribution of Leucoptera daricella (Meyr.), with the description of a new leaf-miner from coffee,** R. WASHBOURN (*Bul. Ent. Res., 30 (1940), No. 4, pp. 455–462, pl. 1, figs. 4*).—Under the name *L. caffeina* a leaf miner which causes damage to coffee trees in Tanganyika Territory, Africa, is described as new.

**Investigations on the biology of Euproctis terminalis Walk., the pine brown tail moth, and its control by aeroplane and ground dusting,** F. G. C. TOOKE (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul. 179 (1938), pp. 48, pl. 1, figs. 20*).—This report of studies of the pine brown tail moth *E. terminalis* and its control presents information as to the biology and advance in control which supplements the data previously noted (E. S. R., 75, p. 376).

**The morphology and biology of the bramble shoot-webber Notocelia uddmanniana L. (Tortricidae),** G. H. L. DICKER (*Ann. Appl. Biol., 26 (1939), No. 4, pp. 710–738, pl. 1, figs. 10*).—A report is made of studies in East Malling, Kent, of the morphology and biology of the several stages in the life cycle of *N. uddmanniana*, a tortricid pest of the loganberry in some fruit-growing areas of Great Britain. In the East Malling district an ichneumonid, *Omorgus mutabilis* H. Gr., parasitizes from 35 to 50 percent of the larvae. A few specimens of an undescribed species of *Apanteles* have been reared from larvae as has a tachinid fly, *Nemorilla notabilis* Mg. Preliminary control measures have given poor results.

**The raspberry-bud moth Carposina adreptella Walk.,** F. J. JEFFREYS (*New Zeal. Jour. Sci. and Technol., 21 (1939), No. 2A, pp. 114A–125A, figs. 11*).—The morphology, life history and habits, seasonal history, parasites, and control of the raspberry-bud moth *C. adreptella*, the source of much loss by raspberry growers in the Nelson district, and which has been recorded as attacking blackberries, are reported.

**New control measures for American strawberry leaf roller,** R. L. PARKER. (Kans. Expt. Sta.). (*Amer. Fruit Grower, 60 (1940), No. 2, pp. 15, 43, figs. 2*).

**The value of proxate, methyl bromide, and chlorosol as fumigants for wax moth,** G. F. TOWNSEND (*Gleanings Bee Cult., 68 (1940), No. 3, pp. 142, 143, 183*).—Chlorosol was found of little value against the wax moth because a prolonged concentration is necessary, it stratifies quite readily, and the cost is high. The cost of proxate was considerably higher than that of the equally effective methyl bromide, which has been found to be of great value in fumigating. The latter readily kills the eggs as well as the larvae, although at times the larvae do not die until several days afterward, since the toxic effect is a slow chemical process within the body of the insect. The cost is quite

low, and it is not as dangerous to use as is cyanogas. It can be used for comb honey fumigation since no odor, taste, or residue is left behind.

**Recent climatic trends intensify the codling moth problem,** P. J. Chapman (*Farm Res.* [*New York State Sta.*], *6* (*1940*), *No. 2, pp. 8, 15, figs. 2*).—A study of temperature and rainfall records has shown that they have a direct relationship to codling moth infestation in two major fruit areas of New York State, namely, the Hudson Valley and Lake Ontario plain. It appears that directly or indirectly the weather has a dominant influence on fluctuation in the activity from year to year of this pest and also on long range trends. That there are other factors entering into the situation, and important ones, is emphasized. Thus, for example, spraying efforts may be developing an insecticide-hardy race of the pest. Further, the concentrated planting of orchards in certain areas creates ideal conditions for building up the general population level of the insect and thus greatly handicapping control efforts. Finally, the problem usually increases as individual orchards grow older. Old orchards are not only difficult and expensive to spray, but old, shaggy-barked trees provide excellent overwintering quarters for the pest.

**The codling moth in the principal fruit regions of France: Studies of its biology and methods of control** [trans. title] (*Ann. Épiphyt. et Phytogénét., n. ser., 5* (*1939*), *No. 2, pp. 105–256, figs. 53*).—The contributions presented, following an introduction by A. Paillot, are: The Codling Moth in Normandie (Normandy), by R. Regnier (pp. 109–122); Five Years of Codling Moth Research in France, by A. Balachowsky and G. Viennot-Bourgin (pp. 123–168); The Codling Moth in the Department of Finistère, 1936–38, by Vincent, Boischot, and Herviaux (pp. 169–171), in Alsace, by P. Sélariès (pp. 173–175), in the Valley of the Loire, by L. Moreau and E. Vinet (pp. 177–181), in the Central Region, 1936–38, by H. Soulié (pp. 183–197), in the Lyonnais and Neighboring Regions, by A. Paillot (pp. 199–211), in the Southwest of France, by J. Feytaud (pp. 213–218), and in the Region of Avignon, 1933–37, by P.-H. Joessel (pp. 219–248). The general conclusions on the biology of this pest in France and on the insecticide and fungicide treatments of apples and pears are presented by A. Paillot (pp. 249–256).

**Observations on the larval diapause of the pink bollworm (Platyedra gossypiella Saund.),** F. A. Squire (*Bul. Ent. Res., 30* (*1940*), *No. 4, pp. 475–481, figs. 5*).—Observations on the pink bollworm in Trinidad are reported upon in tables and graphs.

**Thorough turning, delayed planting, after winter crops,** A. L. Hamner (*Miss. Farm Res.* [*Mississippi Sta.*], *3* (*1940*), *No. 3, p. 8*).—The importance of delayed planting for a certain number of days following the turning under of a cover crop in order to avoid damage to the succeeding crop by the variegated cutworm is emphasized. To be successful through starvation of the cutworm the turning under must be thorough. In the observations conducted cages covering 8 sq. ft. of soil surface were infested with an average of 2½ worms per square foot after the bur clover crop had been thoroughly disked under. The examination of cotton planted on the third, seventh, fourteenth, and twenty-first days after the cover crop was disked under revealed no damage of any commercial importance in the cages in which the cotton was planted on the fourteenth and twenty-first days. Dead worms were found on the thirteenth day, and in each of three cages a live worm was found on the twenty-first day.

**A new species of gall midge predacious on mealybugs,** E. P. Felt (*Hawaii. Ent. Soc. Proc., 10* (*1938*), *No. 1, p. 43*).—Under the name *Dicrodiplosis guatemalensis* description is given of a new cecidomyiid (itonidid) that was reared from larvae predaceous on mealybugs in Guatemala.

**Some economic aspects of the gall midges (Diptera: Cecidomyidae), with special reference to the West Indies,** E. McC. CALLAN (*Trop. Agr.* [*Trinidad*], *17* (*1940*), *No. 4, pp. 63–66*).

**Study on the Trypetidae or fruit-flies of China,** Y. ZIA (*Sinensia, 8* (*1937*), *No. 2, pp. 103–226, pls. 7, figs. 24*).—In this report of a preliminary study, 101 species, representing 43 genera, are recognized on the basis of specimens from south China. One genus is erected and 16 species described as new, with 9 genera and more than 10 species being recognized for the first time as occurring in China. Keys to the genera of the subfamilies Dacinae, Trypetinae, and Tephritinae and to the species of the genera *Paroxyna*, *Tephritis*, and *Tephrella* are included.

**Trypetidae of north China,** Y. ZIA and S. H. CHEN (*Sinensia, 9* (*1939*), *No. 1–2, pp. 180, pls. 8, figs. 44*).—This report on the fruitflies of north China supplements the contribution above noted, recording 36 genera and 135 species of the family Trypetidae. Of these, 2 genera are erected and 62 species described as new, with 8 genera and 10 species being recorded for the first time as occurring in China. Keys for the separation of the genera and species of the subfamilies Trypetinae and Tephritinae are included.

**Autecology of the golden-rod gall fly [Eurosta solidaginis Fitch],** L. J. MILNE (*Ecology, 21* (*1940*), *No. 1, pp. 101–105, fig. 1*).

**Digestive enzymes of the larva of the cattle grub (Hypoderma lineatum (De Villiers)),** S. W. SIMMONS. (U. S. D. A.). (*Ann. Ent. Soc. Amer., 32* (*1939*), *No. 3, pp. 621–627*).—A qualitative study of the digestive enzymes of the third-instar larva of the common cattle grub revealed as present lactase, maltase, invertase, glycogenase, lipase, rennin, trypsin, and erepsin. "Of these only glycogenase, lipase, trypsin, and erepsin, are apparently secreted by the larvae, the others probably being products of bacteria in the intestine, or an ingestation along with the cystic exudate. Digestion occurs mainly in the midintestine, where proteins may be broken down to amino acids and fats and glycogen digested. Small quantities of lipase and erepsin were found in extracts of the macerated tissue of the hindintestine, and these may act on fats and peptones escaping from the midintestine. The gross anatomy of the digestive tract is briefly described. H-ion determinations of the intestinal contents by uncorrected methods indicated a slightly acid pH for all regions except in the hindintestine, where the reactions were predominantly alkaline. The hemolymph was indicated to have a slightly acid reaction."

**Further observations on the bionomics of the ox warble-fly Hypoderma lineatum (DeVilliers) in India,** B. N. SONI (*Indian Jour. Vet. Sci. and Anim. Husb., 9* (*1939*), *No. 4, pp. 431–435, pl. 1, fig. 1*).—The author reports further (E. S. R., 81, p. 811) that the seasonal occurrence of the ox warble fly *H. lineatum*, known officially as the common cattle grub, shows a considerable range in India, and differs markedly from that recorded in the British Isles.

**Responses of the blowflies Cochliomyia americana C. & P. and Phormia regina Meigen to stimulations of the tarsal chemoreceptors,** C. C. DEONIER. (Iowa State Col.). (*Ann. Ent. Soc. Amer., 32* (*1939*), *No. 3, pp. 526–532*).—In blowfly studies, the details of which are given in three tables, the screwworm was found to have on the tarsi and proboscis gustatory chemoreceptors through which nonvolatile substances, such as sucrose and salts, can be detected. "Mercuric chloride was more repellent to *C. americana* in 0.5 M sucrose than in 1.0 M sucrose. Mercuric chloride was less repellent to *P. regina* which were 48 hr. of age than to those that were 24 hr. of age. *P. regina* 48 hr. old were not repelled by a 0.25 percent concentration of this poison in sucrose solution, but the feeding responses were slightly lowered by the presence of the toxic sub-

stance. Sex difference was not an important variable in the responses given to test solutions by the blowfly populations studied. From the results of cage tests, it was concluded that the responses of free blowflies were comparable to the responses of flies that had been subjected to the mounting procedure. The flies were found to select discriminately solutions to be fed upon through chemoreceptors on the tarsi. They died of starvation when 2 gm./100 cc. of mercuric chloride in sucrose solution was the only source of nourishment and water. The death rate was higher and the effects of starvation were rapid in cage tests conducted during the summer months."

**Prevention of damage by the seed-corn maggot to potato seed pieces,** W. J. Reid, Jr., R. C. Wright, and W. M. Peacock (*U. S. Dept. Agr., Tech. Bul. 719 (1940), pp. 38, figs. 4*).—The results of experiments for the development of an effective and practical means of preventing damage by the seed-corn maggot to potato seed pieces, conducted from 1925 through 1933 in the vicinities of Bayboro, N. C., and Charleston, S. C., are reported. This insect, which has become a pest of newly planted potato seed pieces, especially those of the early crop of the South Atlantic Coastal Plain, has been found to be most prevalent in soils containing quantities of decaying vegetation, especially of such crops as cabbage, spinach, and beans. In the preliminary control studies chemical treatment of the seed pieces or the surrounding soil did not prove effective and in most cases tended to increase the maggot injury. The presence on the cut surfaces of seed pieces of lesions caused by the action of such agencies as chemical treatments, bacteria, fungi, or fertilizers was found to induce seed-corn maggot injury. Seed pieces whose cut surfaces became well healed either before or shortly after being planted were found to be practically free of seed-corn maggot attack. In a total of 136 field-plat comparisons, extending over 5 seasons in 3 locations in the coastal areas of North Carolina and South Carolina, seed pieces that were allowed to heal or suberize in advance of planting were practically free of maggot injury, whereas seed planted while freshly cut (the usual practice) had an average of 15.7 percent greater maggot infestation, and the use of the suberized seed resulted in an average increase of 7 bu. of U. S. No. 1 tubers per acre. In the 100 comparisons in which infestations developed, the mean difference in infestation was 19.3 percent and the mean difference in yield was 10.7 bu. in favor of suberized seed. All of these differences were accompanied by highly significant statistical odds.

A list of 30 references to the literature is included.

**Fleas of eastern United States,** I. Fox (*Ames: Iowa State Col. Press, 1940, pp. VII+191, figs. [168]*).—Following an introduction in which the collection and preservation, morphology and terminology, and life history and control are briefly considered, this work deals with the Siphonaptera of the half of the United States east of the one-hundredth meridian with the exclusion of Texas. Fifty-five species, representing 5 families comprising 33 genera, are known to occur in this area. They parasitize about 75 mammalian and avian hosts, including man and domestic animals. Keys are given for the suborders, families, and genera represented. The synonymy of each of the forms represented, descriptions of the male and female, records of occurrence arranged by States, eastern hosts and eastern localities, and type material are included. The work concludes with a synonymic index, a host index systematically arranged, and a selected bibliography of four pages.

**Food preferences of the Colorado potato beetle (Leptinotarsa decemlineata Say),** C. T. Brues (*Psyche, 47 (1940), No. 1, pp. 38–43*).—The author reviews the status of knowledge of food preferences of the Colorado potato beetle and incorporates data that he has recently secured.

**The Japanese beetle,** G. T. French (*Va. State Hort. Soc. Rpt., 44 (1939), pp. 40–44*).—The status of the Japanese beetle and progress of control work in Virginia are briefly dealt with.

**The relation of ants to the Japanese beetle and its established parasites,** R. T. White. (U. S. D. A.). (*Jour. N. Y. Ent. Soc., 48 (1940), No. 1, pp. 85–99*).—Observations of 23 species, representing 11 genera, of Formicidae occurring at Moorestown, N. J., and found to be the most common, are reported. The ants have been observed attacking living larvae as well as adult Japanese beetles in the field, but comparative data from field surveys in areas infested with ants show very little difference in grub population. Results of numerous insectary experiments testing any possible relationship seem to indicate little, if any, harm by the 23 species tried, either to the egg or to any subsequent stage. The silky ant was observed overpowering adult *Tiphia* in the field. Experiments dealing with various formicid species and *Tiphia* cocoons in the soil show only 1 species, the thief ant, to damage cocoons consistently. Cocoons riddled by these tiny workers have been found in the field as well as in the insectary. A single record is given of the finding within a colony of the silky ant of a beetle containing a *Centeter cinerea* egg and of another containing a fly puparium.

**Summerfallow as relating to control of prairie grain wireworm,** J. A. Munro (*North Dakota Sta. Bimo. Bul., 2 (1940), No. 4, pp. 3–5, fig. 1*).—The results of observations of five fields in two localities in Walsh County in 1939 are considered to indicate that clean summer-fallow may be a valuable means of controlling the prairie grain wireworm *Corymbites aeripennis destructor* Brown. The details of observations of the effect of clean v. weedy summerfallow on wireworms and the percentage of wireworms found at various soil depths are reported in tables. The predaceous larvae of carabid beetles are thought to be an important aid in wireworm control.

**The bark and timber beetles of North America, north of Mexico,** W. J. Chamberlin (*Corvallis, Oreg.: OSC Coop. Assoc., [1939], pp. [3]+VI+513, figs. 321; rev. in Ent. Soc. Wash. Proc., 42 (1940), No. 2, pp. 46, 47*).—The status of knowledge of the taxonomy, biology, and control of 575 species belonging to 72 genera of the bark and timber beetles of North America, north of Mexico, of the superfamily Scolytoidea has been brought together with keys to the families and to many of the genera and species. The natural enemies of the Scolytoidea are considered and lists given of the recorded parasites of the Scolytoidea. The interrelationship of roundworms and Scolytoidea, entomogenous fungi and bark beetles, predators, etc., are considered at some length. A bibliography of 450 titles, an alphabetical list, and an index are included. The review is by M. W. B[lackman].

**Notes on the rose stem girdler Agrilus communis rubicola Ab.,** W. G. Garlick (*Canad. Ent., 72 (1940), No. 2, pp. 21–23*).—Observations of the importance of this beetle of European origin, first recorded in North America in 1913, as an enemy of many species and varieties of roses, red raspberry, black and red currants, and gooseberry, and means of control, are reported.

**A parthenogenetic new species of the genus Perimegatoma Horn (Coleoptera: Dermestidae),** H. E. Milliron. (Minn. Expt. Sta.). (*Ann. Ent. Soc. Amer., 32 (1939), No. 3, pp. 570–574, fig. 1*).—The name *P. vespulae* is given to a new parthenogenetic dermestid beetle taken from the nest of a wasp, *Vespula arenaria* (*Fabr.*) (=*diabolica* Sauss.), at St. Paul, Minn.

**Further notes on the ecology and control of pine beetles in Great Britain,** H. S. Hanson (*Bul. Ent. Res., 30 (1940), No. 4, pp. 483–536, pls. 3, fig. 1*).—This report of experiments and observations made in connection with an investigation

of the ecology and control of pine beetles in Great Britain, with special reference to *Myelophilus piniperda* and *M. minor*, is in continuation of the earlier work (E. S. R., 77, p. 824).

**Fumigation of vetch seed for the vetch bruchid,** A. C. JOHNSON, J. S. PINCKNEY, J. W. BULGER, and A. M. PHILLIPS (*U. S. Dept. Agr. Cir. 555 (1940), pp. 11*).—In experimental work on the fumigation of vetch seed for the vetch bruchid, which is found throughout the vetch-growing district of the Middle Atlantic seaboard extending from New Jersey to Georgia, three methods were developed that have given complete mortality of the weevil in infested seed without apparent injury to its viability. These are (1) fumigation with hydrocyanic acid at atmospheric pressures, (2) fumigation with hydrocyanic acid at reduced pressures in a partial vacuum, and (3) fumigation with carbon disulfide at atmospheric pressures. A number of commercial shipments were fumigated with hydrocyanic acid and with carbon disulfide with complete mortality of the weevil in all cases in which the temperature of the seed was 70° F. or above and the room, car, or chamber in which the fumigation was conducted was satisfactorily tight.

**The death-feints of Sitophilus granarius Linn. and Sitophilus oryzae Linn.,** H. B. WEISS (*Jour. N. Y. Ent. Soc., 48 (1940), No. 1, pp. 37–46*).—Observations made recently on the reflex immobilization of numerous specimens of granary and rice weevils are summarized.

**Honey and pollen plants of the United States,** E. OERTEL (*U. S. Dept. Agr. Cir. 554 (1939), pp. 64, fig. 1*).—This list of honey and pollen plants arranged by States was compiled from replies to questionnaires sent to beekeepers (710 sending 1 or more replies each) over a period of years, reports from others interested in apiculture, and from a survey of recent beekeeping publications. Limits of the blooming period and average duration of honey flow for the more important plants are charted for all States having available data. Beekeeping locations, nectar secretion, pollen and pollen plants, and the reported blooming period and duration of honey flow for honey and pollen plants in various States are briefly discussed, and a list by States ranking the major honey plants according to their value as nectar producers is included.

**The mind of the bees,** J. FRANÇON, trans. by H. ELTRINGHAM (*London: Methuen & Co., [1939], pp. XI+146, [figs. 8]*).—This work, based upon observations and experiments conducted by the author and presented in popular form, deals with the subject under the headings of the methodical organization of the work of the bees (pp. 9–53); memory, sense of orientation, and survey (pp. 55–93); bees and colors (pp. 95–104); and intercommunication between the bees (pp. 105–141).

**The Nearctic species of Iseropus (Hymenoptera: Ichneumonidae),** R. A. CUSHMAN. (U. S. D. A.). (*Ent. Soc. Wash. Proc., 42 (1940), No. 3, pp. 51–58, fig. 1*).—Five species of parasites of the genus *Iseropus* are considered, of which *I. californiensis*, reared from *Malacosoma constricta* (Stretch) and *M. californica* (Pack.) at Yosemite and Los Angeles, Calif., and *I. bruneifrons septentrionalis*, reared from *Hemerocampa pseudotsugata* McD. at Sault Ste. Marie, Mich., are described as new.

**The biology of Pachycrepoideus dubius Ashmead (Hymenoptera), a pteromalid parasite of Piophila casei Linne (Diptera),** H. A. CRANDELL. (Ohio State Univ.). (*Ann. Ent. Soc. Amer., 32 (1939), No. 3, pp. 632–654, figs. 14*).—This is a report of studies of the biology of the small pteromalid wasp *P. dubius*, a primary parasite of the common cheese skipper, which attacks the host in the pupal stage. The egg is deposited on the pupa within the puparium, the larva shortly after eclosion killing the host and feeding externally (to the pupa within the puparium) as a scavenger.

**Rearing the caddice fly Limnephilus indivisus Walker and its hymenopterous parasite Hemiteles biannulatus Grav.,** C. E. Mickel and H. E. Milliron. (Minn. Expt. Sta.). (*Ann. Ent. Soc. Amer., 32 (1939), No. 3, pp. 575–580*).—A report of observations of the caddice fly *L. indivisus* is followed by notes on its hymenopterous parasite *H. biannulatus*.

**Notes on the distribution of Cephus pygmaeus Linn. and of its parasite, Collyria calcitrator Grav.,** M. G. Walker (*Bul. Ent. Res., 30 (1940), No. 4, pp. 551–573, figs. 2*).—An analysis made during the past 6 yr. of sets of samples of wheat from various wheatfields near Cambridge, England, with a view to estimating the incidence of the wheat stem sawfly and its parasites, chiefly *C. calcitrator*, is reported upon.

**Three sawflies attacking guava in Brazil (Hymenoptera: Symphyta),** R. B. Benson (*Bul. Ent. Res., 30 (1940), No. 4, pp. 463–465, fig. 1*).—Three species of sawflies found attacking guava in Brazil are noted, of which two are described as new, namely, *Acorduleceros megacephalus* and *Metapedias pyensoni*.

**Notes on the biology of three tenthredinid (Hym.) pests of the guava,** L. Pyenson (*Bul. Ent. Res., 30 (1940), No. 4, pp. 467–469, pl. 1*).—These notes relate to the biology of the gregarious guava sawfly *Haplostegus epimelas* Konow, the guava shoot-boring sawfly *Acorduleceros megacephalus* Benson, and the guava sawfly *Metapedias pycnsoni* Benson, descriptive notes on which by Benson are noted above.

**Unusual infestation of a ship with black widow spiders** (*Pub. Health Rpts. [U. S.], 54 (1939), No. 50, pp. 2195, 2196*).—It is pointed out that rapid and extensive colonization of the black widow spider is possible on shipboard. Once a heavy infestation has occurred, eradication is difficult and can be accomplished only by means of repeated fumigations supplemented by the most rigid inspection.

**The specific identity of the American date mite; description of two new species of Paratetranychus,** E. A. McGregor. (U. S. D. A.). (*Ent. Soc. Wash. Proc., 41 (1939), No. 9, pp. 247–256, figs. 4*).—The author's studies in which mites of 57 distinct collections made from date fruits and foliage, distributed throughout the Coachella and Imperial Valleys in California, were microscopically examined have led to the conclusion that they represent a single species, and that *P. heteronychus* Ewing (1922) is identical with *P. simplex* (Banks 1914), with the latter holding by priority of description. *P. viridis* (Banks 1894) from the pecan is recognized as representing a distinct species. A mite which occurs very commonly on grasses, particularly Bermuda grass (*Cynodon dactylon*), throughout southern California and Arizona and is easily mistaken for the date mite has been found to represent a new species and is described as *P. stickneyi*. The common name "grass mite" is proposed for it. Mites collected from dates in Iraq and Algeria have been found to differ from *P. simplex* and are described as new under the name *P. afrasiaticus*. Although the date mite *P. simplex* is found rather often on grasses, the grass mite *P. stickneyi* has never been found on species of date palms, even when infested grasses grew nearby.

**The New Jersey tick problem,** T. J. Headlee (*New Jersey Stas. Cir. 395 (1940), pp. 12, figs. 5*).—Brief accounts of the five species of ticks recorded from New Jersey, namely, the rabbit tick, lone star tick, castor-bean tick, brown dog tick, and the American dog tick, are followed by a discussion of the tick-transmitted diseases spotted fever and tularemia, a summary of important tick habits and relationships, and tick control as relates to the brown dog tick and the American dog tick.

**Ornithodorus hermsi; Feeding and molting habits in relation to the acquisition and transmission of relapsing fever spirochetes,** G. E. Davis and

M. E. WALKER (*Pub. Health Rpts.* [*U. S.*], *55* (*1940*), *No. 3, pp. 492–504*).—The authors have found that unlike *O. turicata* and *O. parkeri*, which feed but once between molts, *O. hermsi* may feed several times during the fall and winter months without molting and that incident to these multiple intermolting feeding this tick may acquire and transmit spirochetes. It is concluded that under experimental conditions *O. hermsi* passes through a molting rest period during the fall and winter months but may continue to ingest blood, and that ticks may acquire and transmit spirochetes during multiple feedings between molts.

## ANIMAL PRODUCTION

**[Livestock investigations in Missouri].** (Partly coop. U. S. D. A.). (*Missouri Sta. Bul. 413* (*1940*), *pp. 6–8, 15–23, 27, 28, 85–88, figs. 2*).—Brief reports of experiments, by E. A. Trowbridge, H. C. Moffett, J. E. Comfort, M. W. Hazen, L. A. Weaver, A. G. Hogan, H. G. Gahley, J. M. Poehlman, L. R. Richardson, R. E. Guerrant, E. M. Parrott, S. R. Johnson, and D. T. Mayer, include those on the use of a limited grain ration for fattening steers, blackstrap molasses in rations for fattening yearling steers, molasses as a substitute for corn for beef calves, growth in draft colts, the comparative performance of purebred and crossbred pigs, a comparison of protein concentrates as supplements to corn for weanling pigs, the adaptability and value of winter barley as a forage crop for swine, the value of concentrate supplements for pigs on pasture, the nutritive requirements of brood sows, a comparison of systems of grazing bluegrass pastures, the development of highly purified diets for use in vitamin studies with rats and with poultry, and the nutritive factors present in fresh extracts of cereal grasses.

From poultry investigations, by H. L. Kempster, B. Bisbey, J. C. Wooley, and E. M. Funk, results are noted on the time of hatching in relation to egg production, growth rate of chicks under normal conditions, nutritional requirements of White Leghorn pullets, the feed purchasing power of eggs laid by a hen, poultry house construction as related to egg production, factors influencing the production and keeping quality of eggs, the relation of yolk movements and hatchability, the effect of washing eggs on hatchability, the effect of all-night lighting on egg production of turkeys, and the size and shape of turkey eggs.

**[Livestock investigations in Washington]** (*Washington Sta. Bul. 384* (*1939*), *pp. 22–24, 27–29, 63–66*).—Reports of the experiments with livestock and meats, by H. Hackedorn, H. G. McDonald, J. Sotola, W. H. Burkitt, M. Boggs, and M. Beckman, include the utilization of cracked cull peas in combination with dry rolled wheat, dry rolled oats, and/or dry rolled barley for fattening steers; the nutritive values of sweetclover hay, crested wheatgrass, and certain spring range plants, particularly *Agropyron inerme;* and the storage of meats in community freezer lockers.

Reports of poultry investigations, by J. S. Carver, B. B. Bohren, E. I. Robertson, L. A. Wilhelm, J. L. St. John, and J. W. Cook, include the protein values of Alaska peas for chickens, the gross values of protein concentrates, the vitamin D content of salmon meal as affected by methods of preparation and storage, the protein requirements of chicks and laying hens, the effect of heredity and environment on interior egg quality, the effect of storage on egg quality, watery whites in eggs, the light requirements of laying hens, the mineral requirements of growing turkeys, and the vitamin D requirements of turkeys.

**The independence of the endogenous and the exogenous metabolism of nitrogen,** E. W. and H. S. BURROUGHS and H. H. MITCHELL. (Univ. Ill.). (*Jour. Nutr.*, *19* (*1940*), *No. 3, pp. 271–283*).—The endogenous catabolism of rats was assayed during periods when the animals received a vitamin-supplemented

nitrogen-free basal diet and during periods when they received, separate from the basal ration, a small daily supplement of a single amino acid, a simple mixture of amino acids, or egg protein. In the various trials, including the use of 13 individual amino acids and 4 amino acid mixtures and also the egg protein, no evidence was obtained which would indicate that the endogenous metabolism could be depressed by these nitrogen-containing supplements. These findings apparently confirm the independence of endogenous and exogenous types of nitrogen metabolism.

**The amino acids required for the complete replacement of endogenous losses in the adult rat,** E. W. and H. S. Burroughs and H. H. Mitchell. (Univ. Ill.). (*Jour. Nutr., 19 (1940), No. 4, pp. 363–384, fig. 1*).—The amino acids required to replace endogenous losses of nitrogen in adult rats were determined from a series of nitrogen balance trials in which individual amino acids were successively withdrawn from the diet. Lysine, leucine, histidine, arginine, and phenylalanine were not required for the replacement of endogenous losses of nitrogen, although all are required for growth in the rat. Both cystine and methionine were required for the maintenance of nitrogen equilibrium. The cystine requirement could be covered by dietary methionine, but methionine requirement could not be satisfied by dietary cystine. The destruction of tyrosine or tissue constituents derived from tyrosine in endogenous metabolism could be replaced by either dietary tyrosine or phenylalanine. Nitrogen equilibrium could be maintained on a nitrogen supply containing only threonine, isoleucine, tryptophane, valine, methionine, tyrosine, and norleucine.

**The interdependence among amino acids in their utilization in the endogenous metabolism,** E. W. and H. S. Burroughs and H. H. Mitchell. (Univ. Ill.). (*Jour. Nutr., 19 (1940), No. 4, pp. 385–391*).—A series of eight amino acid mixtures containing from 12 to 20 constituents was compared from nitrogen balance experiments. It appeared that from 30 to 50 percent of the nitrogen lost in the endogenous catabolism could be replaced from a variety of incomplete dietary combinations of amino acids, even by mixtures containing none of those amino acids which are essential for the attainment of nitrogen equilibrium. The remainder of the requirement was found to relate to specific amino acids and to be of such a nature that the utilization of the specific amino acids required depended upon the simultaneous presence in the diet of certain combinations of the essential amino acids. The presence of threonine or isoleucine, or possibly both, proved necessary for the utilization of the other amino acids essential for nitrogen equilibrium, suggesting that they may occupy a key position in the anabolism consequent upon the endogenous disintegration of tissue constituents.

**The metabolism of tyrosine, aspartic acid, and asparagine, with special reference to respiratory exchange and heat production,** M. Kriss and L. F. Marcy. (Pa. Expt. Sta.). (*Jour. Nutr., 19 (1940), No. 3, pp. 297–309*).—Continuing this line of investigation (E. S. R., 81, p. 256), tyrosine, aspartic acid, and asparagine were fed to rats as supplements to the basal maintenance ration in quantities supplying 7.5, 5.8, and 6.0 kg.-calories per day, respectively. While a high percentage of each of these compounds was absorbed, nitrogen balances indicated that only 25.1 percent of the total nitrogen ingested as aspartic acid, 13.7 percent of that as asparagine, and none of that ingested as tyrosine was retained in the body. The metabolizable energy values of tyrosine, aspartic acid, and asparagine were found to be 59.2, 71.8, and 60.6 percent, respectively, of the gross energy of these amino acids. The values for oxygen, carbon dioxide, and calories per gram of urinary nitrogen with these various supplements were closely correlated with the ratios of carbon to nitrogen in the materials.

**The influence of urea ingestion on the nitrogen balance and energy metabolism of rats,** M. Kriss and L. F. Marcy. (Pa. Expt. Sta.). (*Jour. Nutr., 19 (1940), No. 2, pp. 151–160*).—From nitrogen, carbon, and energy balance determinations on rats during periods in which they received a maintenance diet and also during periods in which the basal diet was supplemented with 2 gm. of urea per rat daily, it was ascertained that the urea was almost entirely recovered as such in the urine and feces. The urine contained 95.5, 98.5, and 99.8 percent, respectively, of the total nitrogen, carbon, and energy ingested as urea. Urea feeding exerted no significant effect on either heat production or respiratory quotients. From these results it is concluded that rats do not utilize urea to any significant extent, and that the excretion of urea does not exert a specific dynamic effect.

**Symposium on the nitrogen-free extract of foods and feeding stuffs** (*Jour. Assoc. Off. Agr. Chem., 23 (1940), No. 1, pp. 102–161, figs. 2*).—The following papers were presented before this symposium, held at the 1939 meeting of the American Chemical Society: The Origin and Application of the Term Nitrogen-Free Extract in the Valuation of Feeding Stuffs, by C. A. Browne (pp. 102–108), Lignin as a Constituent of Nitrogen-Free Extract (pp. 108–119) and The Hemicellulose Constituents of the Nitrogen-Free Extract (pp. 119–126), both by M. Phillips, Starch as a Constituent of Nitrogen-Free Extract, by F. H. Thurber (pp. 126–131), and Inulin and Hemicellulose in Nitrogen-Free Extract and Possible Importance of Hemicelluloses in Animal Nutrition, by E. Yanovsky (pp. 131–137) (all U. S. D. A.); Pectic Material as a Constituent of Nitrogen-Free Extract, by G. L. Baker (pp. 137–143) (Del. Expt. Sta.); Significance of the Constituents of the So-Called Nitrogen-Free Extract of Plant Materials as a Source of Organic Matter in Soil, by S. A. Waksman (pp. 143–151) (N. J.); Nitrogen-Free Extract From the Plant-Physiological Viewpoint, by F. E. Denny (pp. 151–155); and Nitrogen-Free Extract in Animal Nutrition, by L. A. Maynard (pp. 156–161) (Cornell Univ.).

**The indigestible carbohydrates of feeds,** V. G. Heller and R. Wall. (Okla. A. and M. Col.). (*Jour. Nutr., 19 (1940), No. 2, pp. 141–149*).—Based on digestion and analytical procedures as described, data are presented on the crude fiber, lignin, hemicellulose, cellulose, and total indigestible residue for a considerable number of cereal grains, seeds, hays, prairie grasses, and mixed feeds. No fixed ratio was found between either the amounts of lignin, cellulose, and hemicellulose or crude fiber and the total indigestible residue of the feeds, particularly of the cereal grains. The indigestible residue determined by this method was invariably much greater than the analogous crude fiber value. Digestion trials with rats and sheep indicated that the apparent utilization of cellulose in feeds is greater than that of lignin. The degree of cellulose utilization varied with the type of mixture fed. Analysis of the contents of various portions of the digestive tract of sheep showed considerable variation in the ratio of the percentages of lignin, hemicellulose, and cellulose at various points. These relationships also varied with the type of ration fed.

**Some effects of prolonged vitamin E deficiency in the rat,** A. J. P. Martin and T. Moore (*Jour. Hyg. [London], 39 (1939), No. 6, pp. 643–650, pl. 1*).—Studies at the University of Cambridge gave evidence that when either virgin or pregnant rats were restricted to a vitamin E-deficient diet a brown discoloration of the uterus invariably resulted. This condition could be prevented, but not readily cured, by the administration of vitamin E. Male rats similarly deprived of vitamin E showed such discoloration in the seminal vesicles. Prolonged restriction to the deficient diet resulted in paresis, emaciation, and, in many cases, skin sores. Muscular dystrophy later occurred in the hind limbs of paretic

animals. In advanced cases few normal muscle cells remained, and eventually a degeneration of the convoluted tubules of the kidneys occurred in a high proportion of cases.

**Studies of the physico-chemical state of calcium in the serum of the ruminant,** S. C. Ray (*Biochem. Jour., 33 (1939), No. 10, pp. 1599–1605, fig. 1*).—The influence of different dietary contents of calcium and phosphorus on serum calcium and inorganic phosphorus in sheep was studied. Four sheep received alternately (1) a low-phosphorus basal diet (Ca:P=8.2:1), (2) basal + phosphorus supplement (Ca:P=1.6:1), (3) basal + supplemental calcium + phosphorus (Ca:P=8.2:1), and (4) basal (Ca:P=9.3:1). Serum inorganic phosphorus declined to a low level during the first experimental period, rose to normal during the second, again declined to a relatively low level during the third period, and to a still lower level in the final period. Total serum calcium showed an inverse relationship to the inorganic phosphorus, reaching the lowest level during the second period and the highest level in the final period. The calcium fraction designated as the ultrafiltrable calcium complex remained at an almost constant level throughout the experiment, while the fluctuations in serum calcium were largely at the expense of the calcium ion and the protein-bound calcium fractions. Sheep, goats, and cows subjected to fast were similarly studied. The chief effect was to produce an increase in serum inorganic phosphorus and a decrease in total serum calcium, chiefly through reduction in the calcium ion and protein-bound calcium.

**The chemical composition of forage grasses of the east Texas timber country,** G. S. Fraps and J. F. Fudge (*Texas Sta. Bul. 582 (1940), pp. 35*).—Summaries are presented for the chemical analyses of 1,432 samples of various species of forage gathered at various stages of growth from 100 locations in east Texas and of 82 soil samples representative of the area. A general relation was found to exist between the total nitrogen, active phosphoric acid, and active lime in the soil and the protein, phosphoric acid, and lime in the forage. This correlation was much closer for carpet grass, bluestem, broomsedge, and *Eragrostis lugens* species, than for Bermuda, Dallis, and Georgia grasses. Protein and phosphoric acid decreased materially with advancing maturity of the plants, while crude fiber and nitrogen-free extract tended to increase. Changes in lime content were irregular. A system of grades, 1 to 5, based on the composition of the forage is described. As the plants approached maturity there was a marked increase in the proportion of samples which were deficient or very deficient in protein and phosphorus. Very few of the samples were deficient in lime. Johnson, Dallis, and Bermuda grasses were generally higher in protein, phosphoric acid, and lime than were the principal native species collected. "Forages of east Texas appear to supply sufficient lime to grazing animals, but in general they do not supply enough phosphoric acid and at times they do not supply enough protein."

**The digestibility of mature range grasses and range mixtures fed alone and with supplements,** R. McCall. (Wash. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 1, pp. 39–50*).—From a series of experiments with sheep, data are presented on the chemical composition, coefficients of digestibility, and digestible nutrient content of bluebunch fescue, bluebunch wheatgrass, a range mixture (mature bluebunch wheatgrass with 10 percent of other forages), and this range mixture supplemented with ground barley or linseed cake. The bluebunch fescue was more palatable than the bluebunch wheatgrass, and the coefficients of digestibility were higher for all constituents of the former than of the latter. These grasses contained 37.3 and 34.2 percent total digestible nutrients, respectively. The unsupplemented range mixture was likewise more

palatable than the wheatgrass alone and contained a higher average percentage of total digestible nutrients than either of the grasses in pure stands. The addition of either ½ or ⅛ lb. of linseed cake or ½ lb. of ground barley per 100 lb. of live weight daily to the range mixture increased both the palatability and digestibility of the mixed ration. The barley ration ranked between the rations containing a high level and a low level of linseed meal in total digestible nutrient value. Pregnant ewes were less efficient than lambs in digesting the range mixture either with or without the concentrate supplement.

**The science and practice of conservation; Grass and forage crops,** S. J. WATSON (*London: Fert. and Feed. Stuffs Jour., 1939, vols. 1, pp. XI+415, figs. 13; 2, pp. VII+417–820, figs.* [*15*]).—This treatise, comprising 23 chapters, presents a comprehensive review of the literature, in addition to a detailed account of the researches into the conservation of fodder crops at the Jealott's Hill Research Station, Berks, England.

**Russian thistle silage,** F. T. DONALDSON and K. J. GOERING. (Mont. Expt. Sta.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 3, pp. 190–194*).—Comparative analyses showed Russian-thistles to be equivalent to alfalfa hay in protein and fat contents and superior in their carbohydrate-crude fiber ratio. The thistles also contained much more ash and were relatively high in magnesium and phosphorus, in addition to containing over 8 percent potassium oxide. Russian-thistle silage was prepared in laboratory silos (1) without preservative, (2) with 3 percent sucrose, and (3) with 1 percent phosphoric acid. After 7 mo. the pH values of the expressed silage juices were 4.78, 3.95, and 4.05, respectively. From the general appearance of the silage and analytical data, it is concluded that good silage can be prepared from Russian-thistles with the addition of either sugar or phosphoric acid, but that poor silage will probably result from the use of untreated thistles.

**The feeding value of apple products,** C. W. HOLDAWAY. (Va. A. and M. Col.). (*Va. State Hort. Soc. Rpt., 44 (1939), pp. 95–100*).—A brief résumé, with particular reference to the feeding value of apple silage, wet pomace, pomace silage, and dried apple pomace.

**Second annual report of the Arizona feed control office, year ending December 31, 1939,** W. T. MCGEORGE, E. O. FOSTER, and R. D. TAYLOR (*Arizona Sta. Bul. 168 (1940), pp.* [*1*]*+79–126*).—The guaranteed and found analyses of all mixed feeds, cottonseed meals, and mineral feeds registered for sale during 1939 are presented, along with an explanation of the terms used in feed analysis and the average composition of some common feeding stuffs (E. S. R., 82, p. 89).

**Inspection of commercial feedstuffs,** P. H. SMITH (*Massachusetts Sta. Control Ser. Bul. 99 (1939), pp. 69*).—This report presents results of analyses of 1,942 samples of feeding stuffs intended for livestock and poultry consumption, collected during the year ended September 1, 1939 (E. S. R., 80, p. 809).

**Quantitative chemical determination of certain blood constituents of nonlactating Red Scindi cows,** A. C. GONZAGA (*Philippine Jour. Anim. Indus., 6 (1939), No. 5, pp. 353–356*).—Average quantitative data, based on 15 determinations, are presented.

**The relative merits of producing creep-fed, feeder, and lot-fattened calves in West Virginia,** C. V. WILSON and E. W. MCCOMAS. (Coop. U. S. D. A.). (*West Virginia Sta. Bul. 295 (1939), pp. 12*).—This is a reprint from U. S. D. A. Technical Bulletin 664 (E. S. R., 80, p. 811).

**Beef production and quality as affected by method of feeding supplements to steers on grass in the Appalachian region,** W. H. BLACK, R. L. HINER, L. B. BURK, L. M. ALEXANDER, and C. V. WILSON. (Coop. W. Va. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 717 (1940), pp. 32, figs. 7*).—Uniform experi-

ments were conducted during 3 successive years at Lewisburg, W. Va. In each trial 50 high-grade yearling steers were wintered as a unit and then divided into five experimental lots for summer feeding as follows: (1) Grass alone for an average period of 135 days, (2) grass for 135 days with concentrates for the last 79 days, (3) grass and concentrates for 135 days, (4) grass 191 days with concentrates the last 56 days, and (5) grass 135 days, followed by concentrates and hay in dry lot for 56 days. The average total gains per steer were 239, 291, 314, 348, and 380 lb.; the average sale price per 100 lb. was $8.57, $9.62, $9.70, $9.84, and $9.92; and the average dressing percentages were 52.71, 55.68, 55.75, 56.59, and 55.48 for groups 1 to 5, respectively. While the gains of steers were materially increased by feeding them concentrates supplement on grass, it appeared that the practice of limiting grain to the latter half of the grazing season is more profitable than supplementary feeding throughout the grazing season. Variations in the physical composition of the meat for the various groups receiving concentrates were relatively small. Cattle fed grass alone yielded the lowest percentage of fat and total edible portion in the rib cuts. Rib roasts from the groups fed supplements lost significantly more in total cooking shrinkage than did those of the grass-fed steers. No significant differences in palatability or tenderness of the roasted meat were found between any of the groups of steers.

**Feeding experiment in Rice Belt,** M. G. Snell. (La. Expt. Sta.). (*Cattleman, 26 (1940), No. 10, p. 68*).—In steer feeding experiments, in which cottonseed meal, rice straw, and salt were common to all rations, the results indicated that a mixture of equal parts of rice bran and rice polish had approximately 82 percent the value of ground corn and that combinations of rice products and molasses had from 80 to 90 percent the value of the corn. All steers finished satisfactorily and showed comparatively little difference in dressing percentage and carcass grades, but the average daily gains of the corn-fed group exceeded that of the other lots.

**The welfare of cattle on Florida pastures,** R. B. Becker and J. R. Henderson. (Fla. Expt. Sta.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 3, pp. 185–189*).—A general discussion, indicating that cattle dependent on the forage grown on any definite area are limited in their development and activity according to the amounts of certain minerals contained in that forage.

**Care of bulls for maximum crop of calves,** R. H. Means (*Miss. Farm Res.* [*Mississippi Sta.*], *3 (1940), No. 3, p. 7*).—Practical suggestions are offered for the feeding and management of the bull in beef cattle breeding herds.

**"Swayback" studies in North Derbyshire.—I, The feeding of copper to pregnant ewes in the control of swayback,** G. Dunlop, J. R. M. Innes, G. D. Shearer, and H. E. Wells (*Jour. Compar. Pathol. and Ther., 52 (1939), No. 4, pp. 259–265*).—A total of 260 ewes, secured from an area where the incidence of sway-back was high, was used in this study. These were divided into four experimental groups, all of which had access to affected winter pasture and/or hay from affected areas. Group 1 received no mineral supplement; group 2, a pure salt lick; group 3, salt containing 0.3 percent copper; and group 4, salt containing 1 percent copper. The percentages of ewes giving birth to sway-back lambs were 40, 30, 12.3, and 4.4 for groups 1 to 4, respectively. This remarkably beneficial effect on the prevention of this disease in the progeny was evident when the copper supplement was added as late as 4 weeks before lambing, indicating that the demyelination process in sway-back does not begin until a relatively late stage of intra-uterine life.

**Some factors affecting survival, growth, and selection of lambs,** R. W. Phillips and W. M. Dawson (*U. S. Dept. Agr. Cir. 538 (1940), pp. 18*).—An analysis was made of birth and growth data covering 1,864 lambs of the Hamp-

shire, Shropshire, and Southdown breeds, born at Beltsville, Md., from 1921–34, as related to the selection of animals considered to be suitable for breeding. In general, single lambs were preferred to twins, early lambs to late ones, and lambs that were heavy at birth to lighter ones. The effects of the birth factors were most evident at 3 mo. of age when the weight advantages were in favor of single, early, and heavy lambs. These effects were less marked at 6 mo. and tended to disappear at 12 mo. Male lambs were significantly heavier than females at birth, and this difference became more pronounced with increasing age. The desirability of selecting lambs for breeding purposes at a standard age rather than at a standard time is emphasized. Other suggestions are offered to help overcome weaknesses of the present method of selecting lambs for breeding purposes and for their use in the progeny testing of rams.

**Feeding tests show milo is equivalent to corn as main portion of lamb ration,** I. WATSON (*Colo. Farm Bul.* [*Colorado Sta.*], *2 (1940), No. 2, p. 14*).—In a lamb fattening test of 118 days' duration ground corn and fodder with the ears on the stalk was compared with ground milo with the heads attached. Both lots received a concentrate mixture of barley, cottonseed cake, and alfalfa hay. The average gains per head over the fattening period were 24.84 and 25.35 lb., respectively, and the feed cost per 100 lb. of gain was identical for the two lots. Feed-lot appraisals, dressing percentages, and carcass grades were similar for the two lots. From these results it is concluded that milo fodder is equivalent to ground corn and fodder pound for pound.

**The effect of adding blackstrap molasses to a lamb-fattening ration,** H. M. BRIGGS and V. G. HELLER. (Okla. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *60 (1940), No. 1, pp. 65–72*).—In a series of 10-day digestion trials with wether lambs (four lambs per trial), the digestibility of a corn-alfalfa ration and an oat-alfalfa ration was compared with that in rations in which blackstrap molasses replaced one-half of the corn and oats, respectively. The addition of molasses lowered the digestion coefficients for fat by the highly significant amounts of 18.3 and 17 percent, respectively. The digestion coefficients for protein were also lowered by the addition of molasses, the percentage decrease proving insignificant in the case of the corn ration but highly significant in the case of the oat ration. Digestion coefficients for crude fiber and nitrogen-free extract were not consistently altered by the presence of the molasses.

**Estimating weights of lambs at a constant age,** R. W. PHILLIPS and G. W. BRIER (*U. S. Dept. Agr. Cir. 541 (1940), pp. 16, figs. 6*).—Through a statistical treatment of the actual growth data for lambs of different breeds, the following formula was derived for estimating the weight of lambs at a constant age: $Z\left(\frac{20-A}{X-A}\right)=Y$, in which $Y$ is the estimated weight, $Z$ the actual weight at the actual age $X$, 20 a constant age (any other constant age can replace 20), and $A$ the age intercept, i. e., the point at which a line representing the slope of the growth curve in the vicinity of the constant age intercepts the age axis. Two short-cut methods for estimating weights are outlined. In one, the weight of the lamb is simply multiplied by a predetermined factor, while in the second the estimated weight is read directly from a chart designed for that purpose.

**A horseman's handbook on practical breeding,** J. F. WALL (*Myrtle Beach, S. C.: Thoroughbred Bloodlines, 1939, pp. [10]+308+[3], [figs. 221]*).—This is essentially a digest of opinions and practices of experienced breeders of horses, designed as a practical guide for those inexperienced in this field. Its scope embraces the heavy or draft horse, along with the lighter breeds.

**The western horse: Its types and training,** J. A. Gorman (*Danville, Ill.: Interstate, 1939, pp. 278+[2], [pl. 1, figs. 56]*).—This book describes the breeds, types, and crosses of breeds of horses that are found in the western States and presents methods of training. The subject matter is grouped under three principal headings, i. e., training, types of western horses, and shipping and marketing.

**Gestation period of Philippine mares,** M. M. Robles (*Philippine Jour. Anim. Indus., 6 (1939), No. 5, pp. 405-408*).—The average gestation period of 36 native Philippine mares was 331 days, that of 8 Welsh-natives 335.8, and that of 63 Arab-natives 326.8 days, or an average of 331.2 days for the combined lot.

**The importance of vitamin $B_6$ and factor W in the nutrition of dogs,** J. M. McKibbin, R. J. Madden, S. Black, and C. A. Elvehjem. (Wis. Expt. Sta.). (*Amer. Jour. Physiol., 128 (1939), No. 1, pp. 102-110, fig. 1*).—Employing a purified basal ration of casein, sucrose, cottonseed oil, cod-liver oil, and salt, the requirements of growing dogs for various members of the vitamin B complex were studied. In addition to thiamin, riboflavin, and nicotinic acid, the dog was found to require vitamin $B_6$ and a filtrate factor possibly identical with factor W. The chick antidermatitis factor may also be needed by the dog.

**[Poultry investigations at the Western Washington Station]** (*Western Washington Sta. Rpt. 1939, pp. 40-47*).—Brief progress reports are presented for the following studies, by G. E. Bearse, C. F. McClary, and V. L. Miller: The effect of various types of fiber and bulk on cannibalism in chickens; the value of powdered cheese whey, powdered sour cream buttermilk, and powdered skim milk as supplements to the rations of breeding hens; breeding for disease resistance in chickens; the inheritance of eggshell quality; the vitamin A requirements of laying hens; and the influence of cooling fresh eggs in humidors (evaporation coolers) on their retention of quality during transcontinental shipment.

**The interrelation of lipids in the blood plasma of White Leghorn cockerels,** E. M. Boyd and E. L. Clarke (*Canad. Jour. Res., 18 (1940), No. 2, Sect. D, pp. 49-52, fig. 1*).—Quantitative determinations on blood plasma samples from 22 individuals indicated the following mean lipid values in milligrams per 100 cc. of plasma: Total lipid 520, neutral fat 225, total fatty acids 361, total cholesterol 100, ester cholesterol 66, free cholesterol 34, and phospholipid 155. Comparative data are presented on the mean values for plasma lipid in human, cockerel, rabbit, and guinea pig blood.

**Vitamin requirements in poultry feeding,** R. M. Bethke. (Ohio Expt. Sta.). (*U. S. Egg and Poultry Mag., 46 (1940), No. 1, pp. 44-46, 63, 64*).—A popular résumé.

**White corn shown to be as good as yellow corn in the poultry ration, if supplemented with green feed, grazing, or cod-liver oil,** H. D. Polk (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 3, p. 2*).—Results of a comparison between two chick growing rations, identical in all respects except that one contained white corn meal and the other yellow corn meal, gave evidence that when adequate amounts of alfalfa leaf meal and cod-liver oil are included in the ration white corn is fully as valuable as yellow corn for growing chicks. Other experiments with hens and broilers have indicated that grass clippings or good grazing are satisfactory sources of carotene for chickens.

**Marketing surplus White Leghorn cockerels,** G. P. Goodearl (*North Dakota Sta. Bimo. Bul., 2 (1940), No. 4, pp. 16-19*).—Experimental results on the rate and efficiency of gain of White Leghorn cockerels led to the recommendation that surplus cockerels be marked as soon as they have reached a desirable

market size. A greater return above feed cost could be expected from broilers marketed at 14 weeks of age than from fryers at 18 weeks of age, and either of these practices was preferable to the marketing of roasters at 30 weeks of age. The production of Leghorn capons proved unprofitable.

**Experiments on growing turkeys**, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul. 203 (1940), pp. 50–55*).—Based on 2 years' experimental results, certain recommendations for the feeding and management of growing turkeys are offered. The presence of ground oats in the starting mash caused a digestive disorder which was promptly remedied when the oats were omitted from the mixture. Too many poults under one hover led to serious losses from piling up and smothering. A comparison of groups of birds on range, confined in colony houses with wire sun porches, and confined without access to sunlight indicated a high loss of birds on the range from accidental and predatory causes which more than offset any saving of feed. Confined birds having access to sunlight had a higher feed requirement per unit of gain than birds confined indoors and provided with ultraviolet irradiation or a cod-liver oil supplement. Disease was a relatively unimportant factor under the conditions of these trials. Discontinuance of cod-liver oil feeding at least 4 weeks before slaughtering is recommended to prevent fishy flavor of the meat.

Formulas are given for satisfactory starting and growing rations.

**The practical brooding of turkey poults**, G. C. CRANDALL (*New Jersey Stas. Hints to Poultrymen, 27 (1939), No. 1, pp. 4*).—A discussion of recommended practices.

**Development of molds on cold storage eggs, I, II**, W. L. MALLMAN and C. E. MICHAEL. (Mich. Expt. Sta.). (*U. S. Egg and Poultry Mag., 46 (1940), Nos. 1, pp. 34, 35, 64; 2, pp. 98–101, 126*).—Two phases of this problem are discussed.

I. *Isolation and identification of molds found on cold storage eggs and their containers.*—Based on approximately 850 isolations of molds from cold-storage eggs and egg containers, data are presented on the various types of molds encountered and the frequency with which they occur on containers, on the outside of eggs, and on the inside of eggs. Penicillia molds predominated, and with the exception of *Hormodendron* sp., molds of this genus were the only ones capable of penetrating the shell surface. Practically all species of penicillia showed this ability. Mucor molds were frequently isolated, but these did not cause any apparent danger to the egg quality or appearance. It was evident that molds found on the eggs came from contamination from such sources as the handling and packing, both before and after reaching the cold-storage plant.

II. *Prevention of growth.*—Under this phase, two types of disinfecting agents were tested, first, those acting through direct contact, and, second, those which give off continuously a vapor inhibitory to the germination of mold spores or the development of the mold mycelia. Of the many contact disinfectants tested, none were found which would effectively suppress the growth of molds on the eggs, although they prevented the developments of molds on the packaging material. Compounds having high vapor pressures were found to be effective mycostatic agents, both under laboratory and commercial conditions. A phenol derivative (sodium pentachloro phenate) proved to be the most economical and practical compound among the groups studied. The presence of as little as 0.4 percent of this compound prevented the development of molds under all degrees of humidity, while the presence of 0.8 percent of the compound had no deleterious effect on the odor or taste of the stored eggs.

## DAIRY FARMING—DAIRYING

**[Investigations with dairy cattle and dairy products in Missouri]** (*Partly* coop. U. S. D. A.). (*Missouri Sta. Bul. 413* (*1940*), *pp. 36, 37, 40–43, 46–50, 51–57, 58*).—Investigations by A. C. Ragsdale, H. A. Herman, S. Brody, V. Herring, L. E. Washburn, C. Elder, C. W. McIntyre, C. W. Turner, W. R. Graham, E. R. Garrison, and R. G. McCarty include the comparative value of Korean lespedeza and soybean and alfalfa hays for milk production; interrelations between growth in linear size and body weight; diurnal variations in basal energy metabolism; respiratory and fermentation gases of ruminants; the length of gestation in the dairy cow, with particular reference to Bang's disease; rigid selection and the continuous use of proved sires as a means of developing a strain of dairy cattle for high production; roughage as a sole ration for lactating cows; the precursors of the constituents of milk and the energy requirements of milk secretion; variations during the lactation period in the chlorine, catalase, and pH values of milk from normal bovine udders; the germicidal action of antiseptic dyes on *Streptococcus agalactiae* in naturally infected milk; a ration for inducing rapid growth in dairy calves; and the rate of development of dairy calves fed only alfalfa hay and milk.

From experiment with dairy products, by Turner, Garrison, Herman, Ragsdale, A. J. Bergman, W. H. E. Reid, and W. S. Arbuckle, results are noted on the vitamin C content and curd tension of goat's milk; the solids-not-fat content of milk and seasonal variations in the fat and solids-not-fat content of mixed herd milk; methods for determining lactose in milk; the effects of temperature and the addition of sugars to milk on the methylene blue reduction test; the effect of serving temperature upon consumer acceptance of ice creams and sherbets; and the quality improvement of butter and cottage cheese.

**[Investigations with dairy cattle and dairy products in Washington].** (Partly coop. U. S. D. A. and West. Wash. Expt. Sta.). (*Washington Sta. Bul. 384* (*1939*), *pp. 30–33*).—Reports of dairy cattle studies, by R. E. Hodgson and J. C. Knott, include the proving of dairy sires and the effects of the type of construction on the losses and nutritive value of stack silage.

Reports of dairy products studies, by C. C. Prouty, E. C. McCulloch, N. S. Golding, and H. A. Bendixen, include the bacterial development in milk from udder quarters infected with mastitis; the manufacture, ripening, and development of foreign varieties of cheese; and the suitability of certain cheeses for frozen-pack methods of storage.

**[Dairy cattle investigations at the Western Washington Station].** (Coop. Wash. Expt. Sta. and U. S. D. A.). (*Western Washington Sta. Rpt. 1939, pp. 13–19*).—In addition to the studies noted above, results are presented by R. E. Hodgson, J. C. Knott, H. K. Murer, R. R. Graves, and K. Baur on the nutritive value and vitamin A activity of pea cannery refuse, the methods of measuring pasture yields, and a comparison of the nutritive values of a home-grown hay and silage ration v. an alfalfa hay ration for lactating dairy cows.

**Cooperative dairy bull associations,** J. G. Winkjer (*U. S. Dept. Agr., Farmers' Bul. 1830* (*1939*), *pp.* [2]+*17*, *figs. 6*).—This supersedes Farmers' Bulletin 1532 (E. S. R., 57, p. 571).

**Comparative physiological responses of dairy calves fed rations having different levels of milk proteins,** G. H. Wise, W. E. Petersen, and T. W. Gullickson. (Minn. Expt. Sta.). (*Jour. Dairy Sci., 23* (*1940*), *No. 2, pp. 91–102, figs. 6*).—To determine the influence of various levels of milk protein in the diet of calves receiving whole milk as a basal ration, one group of calves received a supplement of glucose and the second a supplement of casein so that with

increasing age the ration of the two groups contained similar amounts of total energy. All calves regardless of the supplement possessed a depraved and erratic appetite. The abnormally high casein content of the ration did not adversely affect the growth or the general appearance of the calves but did induce lethargy and occasional digestive disturbances. Plasma nitrogen values were high in the calves receiving casein and comparatively low in those receiving glucose.

**Phosphoric acid makes pickles for dairy cows,** C. F. Rogers. (Minn. Expt. Sta.). (*Hoard's Dairyman, 84 (1939), No. 10, pp. 316, 317, fig. 1*).—Recommendations are offered for the use of phosphoric acid as a preserving agent in the preparation of grass and legume silages.

**Hypermagnesemia without clinical symptoms in dairy cattle,** M. W. and D. F. Eveleth and F. E. Walsh. (Iowa State Col.). (*Jour. Dairy Sci., 23 (1940), No. 2, pp. 85–89*).—Determinations of serum magnesium in Jersey cows at intervals during 1934 and 1936 gave evidence of a rather marked increase in serum magnesium during midsummer of each of these years when the cows were subjected to the influence of drought conditions. In practically all cases serum magnesium values declined to a normal level in the early fall. No evidence was obtained to indicate that the temporary high blood magnesium content exerted a deleterious effect on the animals. The cause of this phenomenon remains unexplained.

**Studies on the composition of bovine blood.—II, Seasonal variations in the level of magnesium in the blood plasma of growing dairy calves,** C. W. Duncan, C. C. Lightfoot, and C. F. Huffman. (Mich. Expt. Sta.). (*Jour. Dairy Sci., 23 (1940), No. 2, pp. 125–134, fig. 1*).—Continuing this series of investigations (E. S. R., 80, p. 676), an attempt has been made to ascertain what factors are responsible for the marked fluctuations which occur in the blood plasma magnesium of calves. While some degree of linear correlation was found to exist between plasma magnesium values and a number of environmental factors, including temperature, sunshine, precipitation, barometric pressure, and relative humidity, none were wholly satisfactory in explaining why these variations occur in the animal body. Low plasma magnesium values were associated with those months in which there were more than 8 hr. of sunshine per day and when the mean and maximum mean temperatures were above 55° and 70° F., respectively. A pronounced seasonal variation in magnesium concentration was evident, with periods of high and low concentration occurring which could not be attributed to age or food intake.

**A study of the effects of increased iodine feeding to a herd of sixty dairy cows,** J. H. Meyer, N. L. Matthews, and G. M. Curtis. (Ohio State Univ.). (*Ohio Jour. Sci., 40 (1940), No. 1, pp. 9–24, figs. 2*).—Reporting the results of further investigations (E. S. R., 82, p. 811), data are presented for a series of iodine balance experiments with cows receiving a normal ration and cows receiving an iodine supplement. No deleterious effect of increased iodine feeding was detected. The blood iodine values for iodized cows averaged approximately 10 times that of the control cows. On high iodine intake the iodine in milk was much greater than that in the blood, while on the low iodine intake the iodine in the milk was frequently below the normal value. Approximately 70 percent of the ingested iodine was excreted in the feces. In all cases the cows were practically in iodine equilibrium, the ratio of intake to output being slightly above 1 in the December and February trials and slightly less than 1 during August.

**The cow tester's manual,** J. F. Kendrick (*U. S. Dept. Agr., Misc. Pub. 359 (1940), pp. [2]+II+36+[1], figs. 17*).—This supersedes Miscellaneous Circular 26 (E. S. R., 52, p. 478).

**A simple device for sampling air-borne bacteria,** A. HOLLAENDER and J. M. DELLAVALLE (*Jour. Milk Technol., 2 (1939), No. 6, p. 307, fig. 1*).—The device is described and illustrated.

**The coliform test,** D. LEVOWITZ (*Jour. Milk Technol., 2 (1939), No. 6, pp. 300–303*).—A critical discussion.

**Variations in the oxygen content of milk,** P. F. SHARP, D. B. HAND, and E. S. GUTHRIE. (Cornell Univ.). (*Vt. Dairy Plant Oper. and Mgrs. Assoc., Short Course Conf. and Ann. Mtg., 18 (1939), pp. 108–110*).—From the data obtained on the oxygen content of milk samples taken immediately after milking and at different stages of processing, it is concluded that various amounts of oxygen are introduced into the milk in the process of milking and that milk plant operations may also alter the oxygen content. The oxygen in milk tended to decrease during holder pasteurization but increased considerably when it passed over the surface cooler.

**The effect of the elimination of oxygen from milk on the oxidized flavors,** P. F. SHARP, D. B. HAND, and E. S. GUTHRIE. (Cornell Univ.). (*Vt. Dairy Plant Oper. and Mgrs. Assoc., Short Course Conf. and Ann. Mtg., 18 (1939), pp. 18–22, fig. 1*).—The design and method of operation of a continuous milk deaerating unit is described. Data are presented which indicate that this process efficiently removes dissolved oxygen from milk, and that the deaerated samples show a better retention of flavor score and ascorbic acid content and also are much less susceptible to oxidized flavor development during storage than normally pasteurized and cooled samples.

**The cause and control of rancid flavour in milk,** N. P. TARASSUK. (Univ. Calif.). (*Canad. Dairy and Ice Cream Jour., 19 (1940), No. 3, pp. 32, 36, 54, 56, 92*).—In a more comprehensive report (E. S. R., 81, p. 701), the subject is reviewed and results are presented on various phases of the studies on rancid milk. With one cow producing milk in which a lipase was naturally active, it was found possible to produce at will milk having high lipolytic activity or entirely free from it by changing from a dry feed to a green feed. The surface tension of milk was found to be consistently lowered as a result of lipase action to such an extent that it was possible to detect rancidity in milk and to follow its progress through surface tension measurements. Rancid milk exerted an inhibiting effect on the activity of lactic acid starters, coagulation being markedly delayed when a high proportion of rancid milk was used in mixtures of fresh and rancid milks. Lipase activity was completely inhibited by heating to 130° F. for 30 min. and partially inhibited at 110° for a like period.

**Maintaining color and flavor in Guernsey milk,** J. W. BARTLETT, O. F. GARRETT, R. P. REECE, and R. P. HARTMAN (*New Jersey Stas. Bul. 675 (1940), pp. 24, figs. 8*).—The lactochrometer, an instrument for measuring the intensity of yellow color in milk, is described, and data are presented of the frequency distribution of color readings in Guernsey milk. It appeared that bimonthly color tests gave a reliable measure of the average color for a complete lactation period. Of the various environmental factors affecting milk color, feed was found to have a pronounced effect. Green pasture produced milk of the highest color, while properly ensiled immature grasses and legumes when fed during the winter period produced milk almost equal in yellow color to that produced on pasture. The seasonal variations in color proved to be primarily due to changes in types of roughage fed. Season of calving was a minor factor influencing the average color of milk of a complete lactation. After the third month of lactation milk color tended to increase slowly, following a trend similar to the increasing butterfat content with advanced lactation. Intensity of milk color tended to increase with the age of the lactating animal. It also tended to increase with increasing fat content of the milk but to decrease as the level of milk production

increased. Factors affecting the stability of milk color and the relation of color and of ascorbic acid content to flavor are discussed (E. S. R., 82, pp. 242, 673). Suggested practices for controlling the color and flavor of milk are offered.

**Increasing the viscosity of cream,** L. H. Burgwald. (Ohio State Univ.). (*Milk Dealer, 29 (1940), No. 6, pp. 52, 54*).—By slowly heating cream to 84°–86° F., holding briefly at this temperature, and then slowly cooling it to between 60°–50° before packaging and aging, creams containing 20, 22, and 25 percent butterfat were increased in viscosity by 8.3, 28, and 52.5 percent, respectively.

**Fat losses in buttermaking,** D. Henry and W. Slatter. (Ohio State Univ.). (*Natl. Butter and Cheese Jour., 31 (1940), No. 3, pp. 12, 13*).—In considering the effects of various factors on fat losses in buttermaking, it was found that no significant differences occurred in using the roll-less churn and the single-roll churn. The shape of the churn, i. e., ratio of length to diameter of barrel, exerted an influence both on churning time and butterfat losses. Pumping cream with a centrifugal pump at 150° F. materially increased fat losses as compared with pumping at 90°. Checks on the fat losses under a commercial creamery practice indicated a range of typical losses from 1.21 to 1.48 percent fat. Low fat content of the cream, high initial acidity, and holding the cream less than 1 hr. before churning were all conducive to high fat losses in the buttermilk.

**The slow starter problem,** J. G. Davis (*Dairy Indus., 4 (1939), No. 11, pp. 387–390*).—A review, with 38 references to the literature.

**Italian cheese industry growing in New York State,** M. W. Yale (*Farm Res. [New York State Sta.], 6 (1940), No. 2, p. 7, fig. 1*).—A brief discussion of the various types of Italian cheeses now being manufactured in the State and their relative significance in the cheese industry.

**How cheese quality is determined,** J. C. Marquardt (*Farm. Res. [New York State Sta.], 6 (1940), No. 2, pp. 13, 14, fig. 1*).—Points to be observed in the grading of cheese are briefly discussed.

**The denaturation of the soluble proteins of whey by heat,** O. R. Irvine and W. H. Sproule (*Canad. Dairy and Ice Cream Jour., 19 (1940), No. 3, pp. 62, 64, figs. 3*).—Studies were conducted at the Ontario Agricultural College on the effect of the acidity of the product and the temperature and holding time of pasteurization on the degree of denaturation of soluble proteins of whey. Acidity of the whey proved to be an important factor, the percentage denaturation during pasteurization at 66.1° C. for 30 min. averaging 2.1, 5.7, and 21.7 percent at pH 6.35, 5.5, and 4.6, respectively. The only exception to this trend was the tendency for a greater proportion of nitrogenous material to be denatured at a high rather than a low pH when relatively high pasteurizing temperatures were employed. Increasing the length of the holding period did not greatly increase the percentage of denaturation except in the case of low acid wheys heated to relatively high temperatures. For any given pH and holding time the extent of denaturation markedly increased with increasing pasteurization temperatures.

**Producing quality by-products, particularly casein,** B. R. Davisson (*Vt. Dairy Plant Oper. and Mgrs. Assoc., Short Course Conf. and Ann. Mtg., 18 (1939), pp. 82–87*).—A continuous-process method of casein manufacture is described in considerable detail. Reference is also briefly made to the utilization of whey from this process.

**A method for the accurate sampling of ice cream,** A. C. Maack and P. H. Tracy. (Univ. Ill.). (*Ice Cream Rev., 23 (1940), No. 8, pp. 36, 58*).—The method, developed to permit an accurate sampling of ice creams containing added products such as fruits or nuts, consists in beating a 4- or 5-oz. sample in a malted-milk shaker until the fruit or nuts are sufficiently broken up to allow a test for fat by the Mojonnier method. Nut ice creams tended to show an increase in fat

test over the calculated value when the nuts were first broken up in this manner, but fruit ice creams generally checked closely with the calculated values. Mixing chocolate chip or mint ice cream hastened the time required to dissolve the candy but did not appreciably increase the accuracy of the test. Churning of the sample could be overcome by warming it and then beating it again.

**Measuring the quality of ice cream**, W. H. Martin, F. E. Nelson, and W. J. Caulfield. (Kans. Expt. Sta.). (*Jour. Dairy Sci., 23 (1940), No. 2, pp. 135–147*).—The criteria employed in this study were the standard plate count, the minimum amount of sample containing *Escherichia-Aerobacter* organisms, the phosphatase test, the butterfat test, weight per gallon, and flavor, body and texture, color, and package scores. Samples containing less than 200,000 bacteria per cubic centimeter tended to have a high total score minus bacterial score, but with counts above 200,000 no relationship between count and score was apparent. Standard plate counts tended to increase as the smallest amount of sample containing *Escherichia-Aerobacter* organisms decreased. Only 5.4 percent of the samples tested were positive to the phosphatase test, although a much higher number of samples would have been suspected if suitable controls had not been run. These positive samples were rather unsatisfactory as judged by a number of the criteria. Most of the samples contained over 10 percent butterfat. The samples ranged from under 4 to over 7.5 lb. per gallon, with those weighing from 4.5 to 5.5 lb. most frequently associated with high body and texture scores. These findings emphasize the necessity of employing a number of tests in order to ascertain the true quality of ice creams.

**A discussion of sweetening agents for ice cream**, P. H. Tracy. (Univ. Ill.). (*Canad. Dairy and Ice Cream Jour., 19 (1940), No. 3, pp. 58, 60*).—The use of various nonsucrose sweetening agents, including dextrose, sweetose, and honey, in ice cream manufacture are discussed.

## VETERINARY MEDICINE

**[Work in animal pathology and parasitology by the Missouri Station]** (*Missouri Sta. Bul. 413 (1940), pp. 97–103*).—Report is made of the work of the year (E. S. R., 78, p. 246) with fowl paralysis, leucosis in fowls, blackhead in turkeys, and agglutination blood testing for pullorum disease in fowls, all by A. J. Durant and H. C. McDougle; parasites of sheep and studies of cattle that consistently give low titer reactions to the Bang agglutination test, both by C. Elder and O. S. Crisler; and comparisons of the tube agglutination and rapid or plate tests on low reacting serums in Bang's abortion infection, transmission of Bang's abortion infection from swine to cattle, low agglutination reactions in unbred gilts, and toxemia in sheep, all by Elder.

**[Work in animal pathology by the Washington Station]** (*Washington Sta. Bul. 384 (1939), pp. 25, 68, 69*).—The work of the year (E. S. R., 81, p. 274) reported upon includes swine arthritis and erysipelas, by H. G. McDonald and E. C. McCulloch; development and spread of bovine mastitis, hard liver disease of swine, and the efficiency of farm disinfectants, all by McCulloch; and the isolation of a Gram-positive coccus from birds in serological tests, by R. H. Hurt.

**A symposium on the blood and blood-forming organs** (*Madison: Univ. Wis. Press, [1939], pp. VIII+264, [pls. 27], figs. [47]*).—This symposium on the blood and blood-forming organs, conducted by the Medical School of the University of Wisconsin in September 1939, includes the following contributions: Some Historical Aspects of Hematology, by E. Meulengracht (pp. 3–13); The Porphyrins and Diseases of the Blood, by C. J. Watson (pp. 14–30) (Univ. Minn.); Aplastic Anemia, by C. P. Rhoads (pp. 31–40); Anemia Due to Iron

Deficiency, by C. W. Heath (pp. 41–51); Anemias of Nutritional Deficiency, by G. R. Minot (pp. 52–56); The Erythroblastic Anemias, or, Anemias Associated With Erythroblastemia, by L. K. Diamond (pp. 57–71); Some Etiological Factors in Pernicious Anemia, by E. Meulengracht (pp. 72–82); The Nature of Hemolytic Anemia, by R. L. Haden (pp. 83–104); Experimental Leukemia, by J. Furth (pp. 105–125), and Monocytic and Subleukemic (Aleucocythemic or Aleukemic) Leukemia, by C. E. Forkner (pp. 126–147) (both Cornell Univ.); The Present Status of Hodgkin's Disease, by E. B. Krumbhaar (pp. 148–166); The Reticulo-Endothelial System, by C. A. Doan (pp. 167–193) (Ohio State Univ.); Infectious Mononucleosis Hematologic and Pathologic Aspects, by H. Downey (pp. 194–206) (Univ. Minn.); Polycythemia, by P. Reznikoff (pp. 207–218) (Cornell Univ.); Marrow Cultures, by E. E. Osgood (pp. 219–241); and the Present Status of the Blood Coagulation Problem, by H. Eagle (pp. 242–264).

**The diseases of the genital organs of domestic animals,** W. L. Williams (*Ithaca, N. Y.: Author, 1939, 2. ed., pp. XII+617, pls. 3, figs. [197]*).—A second revised and enlarged edition of this work (E. S. R., 46, p. 482).

**The fate of copper in the blood stream,** A. Eden and H. H. Green (*Jour. Compar. Pathol. and Ther., 52 (1939), No. 4, pp. 301–315, figs. 2*).

**Selenium poisoning,** W. B. Davidson (*Canad. Jour. Compar. Med., 4 (1940), No. 1, pp. 19–25, figs. 6*).—A summary of information on the occurrence, symptoms, and treatment of this affection.

**Certain ecological characteristics of orange sneezeweed,** J. T. Cassady. (U. S. D. A. and Colo. State Col.). (*Ecology, 21 (1940), No. 1, pp. 87–90, fig. 1*).—Studying this poisonous plant (*Helenium hoopesi*) in 37 different areas in the mountains of western Colorado, the author describes it and discusses its plant associates; natural enemies; reproduction, migration, and establishment; and poisonous qualities. It is noted as immediately important to the livestock industry that management practices minimizing losses be developed for ranges infested with this plant.

**Oxytenia found to be poisonous to livestock,** F. Thorp, Jr., L. W. Durrell, G. S. Harshfield, and C. G. Barr (*Colo. Farm Bul. [Colorado Sta.], 2 (1940), No. 2, pp. 18, 19, fig. 1*).—Attention is called to the poisonous nature of the oxytenia weed (*Oxytenia acerosa* Nutt.), an account of which has been noted (E. S. R., 82, p. 679).

**Germicidal mercury derivatives of pyridine,** M. W. Swaney, M. J. Skeeters, and R. N. Shreve. (Purdue Univ.). (*Indus. and Engin. Chem., 32 (1940), No. 3, pp. 360–363*).—In an investigation of the reaction between pyridine and mercuric acetate at elevated temperatures over a rather wide range of conditions, "the mercuration of pyridine was effected at 155° C. to give yields of monosubstitution products which make the process commercially feasible. The presence of substantial quantities of water minimizes the production of polymercurated derivatives. For the first time a true pyridylmercuric compound has been tested germicidally. This is an extremely potent type of bactericidal agent of relatively low host toxicity. 3-Pyridylmercuric chloride in a dilution of 1 part in 2 million parts of water completely prevents the growth of *Staphylococcus aureus*. The mercury derivatives of pyridine are stable toward hydrolysis, and possess possible application as antibacterial agents in medicine and many commercial processes."

**An attempt to demonstrate a filtrable form of Brucella abortus,** C. P. Fitch and A. G. Karlson. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 757, pp. 501, 502*).—The authors are unable to demonstrate the presence of *B. abortus* in filtrates of cultures of the micro-organism in broth containing tuberculin.

**Incubating hen's egg as a culture medium for Brucella abortus, H. J. Metzger and F. R. Stokes.** (N. J. Expt. Stas.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 756, pp. 369–371*).—Eleven egg-to-egg transfers of two strains of *B. abortus* (strain 19 and a virulent B. C. G. strain) failed to cause them to undergo any changes in virulence, cultural characteristics, or antigenic properties. Efforts to use incubating eggs for the purpose of typing different strains of *B. abortus* were unsuccessful.

**The therapeutic activity of sulfanilamide and allied compounds in experimental brucellosis of mice, J. A. Kolmer, with assistance of A. M. Rule** (*Jour. Pharmacol. and Expt. Ther., 68 (1940), No. 3, pp. 406–412*).—In this study, mice were inoculated intra-abdominally with *Brucella abortus*, *B. melitensis*, and *B. suis* of sufficient virulence for the production of acute infections with associated septicemias and ending fatally in about 7 to 10 days. All 5 of the compounds employed, sulfanilamide, neoprontosil, sulfapyridine, dagenan, and aldanil, showed best therapeutic results in the case of 160 mice that were infected with *B. abortus*. For the 160 infected with *B. melitensis*, the compounds were much less effective, while for the 80 infected with *B. suis* the therapeutic effects were nil insofar as survival was concerned although all, especially sulfanilamide and sulfapyridine, appreciably prolonged the lives of the mice.

**Some taxonomic characters of cuterebrine (Diptera) larvae, with larval descriptions of two species from Georgia, E. F. Knipling and A. L. Brody.** (U. S. D. A.). (*Jour. Parasitol., 26 (1940), No. 1, pp. 33–43, figs. 12*).

**Studies on cercarial dermatitis and the trematode family Schistosomatidae in Manitoba, J. A. McLeod** (*Canad. Jour. Res., 18 (1940), No. 1, Sect. D, pp. 1–28, pl. 1, figs. 7*).—This contribution relates to a biological investigation of cercarial dermatitis in Manitoba which has been shown to be due to three species of apharyngeal brevifurcate cercariae. "An ecological study of the organisms and their molluscan hosts has been carried out, and descriptions of the general types of habitats are given in addition to the distribution of the organisms. A synopsis of the dermatitis-provoking cercariae and the adult schistosomes of the world is given, and the classification of the adults is revised in part. The results of a survey of mammals and birds for adult schistosomes and also the results of experimental exposures of animals are included. A new species of apharyngeal brevifurcate cercaria and two new species of *Ornithobilharzia* are described. The description of *Cercaria wardlei* McLeod, 1934, is revised."

A list is given of 159 references to the literature.

**The susceptibility of guinea pigs to equine encephalomyelitis virus inoculated through various routes, C. F. Schlotthauer** (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 757, pp. 490–492*).—Experiments reported indicate that "intracerebral inoculation of material suspected of containing equine encephalomyelitis virus is more reliable than inoculations made in other sites when guinea pigs are used as the test animals."

**Relapsing fever: Data implicating Ornithodorus hermsi as a vector in northern Idaho, C. B. Philip and G. E. Davis** (*Pub. Health Rpts. [U. S.], 55 (1940), No. 3, pp. 504–507*).—The occurrence of relapsing fever in a cabin in Idaho in association with a known vector, *O. hermsi*, is reported. Diagnosis was confirmed by laboratory procedure, and one of the strains recovered was successfully passed between white rats by a previously noninfected California strain of this tick.

**Studies upon Strongylus vulgaris.—IV[b], V, J. H. Whitlock.** (Kans. Expt. Sta.). (*Jour. Parasitol., 26 (1940), No. 1, pp. 45–57, fig. 1*).—Further studies are presented (E. S. R., 81, p. 846).

IV [b]. *A method of determining the endpoint of the reaction of a lethal agent against adults in vitro* (pp. 45–47).—A description is given of an instrument which measures with a fair degree of accuracy the appearance of rigor mortis in *S. vulgaris* during tests in vitro, and thus makes an excellent criterion of death. It is pointed out that although such a method is not perfect, it permits of greater accuracy than any other method applicable to helminths thus far proposed.

V. *In vitro toxicity of copper sulphate and the cupric halides* (pp. 49–57).—The toxicity of simple copper compounds for nematode parasites varies with "the amount of soluble copper available and the toxicity of the anion joined with the copper ion. The fact that simple inorganic copper compounds can remain in their effective soluble form only in an acid portion of the digestive tract affords a rationale for the effective action of copper sulfate against *Haemonchus contortus* in the abomasal lumen and its ineffectiveness against parasites in a more neutral environment. The time-action experimental method offers definite promise in anthelmintic experiments in vitro. A prediction is made of the properties of a more universally effective copper-containing anthelmintic as revealed by these experiments."

**Note on cultivation of Trichomonas foetus**, G. E. Daniel. (Univ. Md.). (*Jour. Parasitol., 26 (1940), No. 1, p. 85*).—It has been found that *T. foetus* can be maintained for an apparently indefinite period in a culture medium which contains no thermolabile substance. A description is given of such a medium that has been used in the laboratory since May 1939. It is a modification of that used by Rees in 1937 (E. S. R., 78, p. 396).

**Cultural observations on Trichomonas foetus**, J. Andrews and H. S. Lyford (*Amer. Jour. Hyg., 31 (1940), No. 2, Sect. C, pp. 43–50*).—Report is made of cultural work conducted with this flagellate, now recognized as of particular importance as the cause of disease in dairy cows. The migration technic described by R. W. Glaser and N. A. Coria[5] has repeatedly been shown to be effective in separating *T. foetus* from associated bacteria.

"Inoculation for successful migration purposes should contain a high concentration of active trichomonads and be free from motile bacteria. Uterine contents of infected cattle or guinea pigs give best results. Material with scanty, sluggish flagellates may sometimes be improved by filtration and centrifugation or by passage through guinea pigs. The amounts of agar should be varied to make a gel which will just support red blood cells at room temperature during migration. V-tubes with the inoculation arm attached about an inch from the bottom are better than those in which the arm is attached at the bottom since they permit sampling below the point of inoculation. The V-tubes should be examined 5 to 12 hr. after inoculation. If trichomonads cannot be found above the inoculation, samples should be taken lateral to and below this point. Not all lots of *T. foetus* migrate upwards and none of them appear to do so exclusively. Sterile Petri dishes may be substituted for V-tubes by placing inoculum at a central point, from which trichomonads migrate radially. Out of over 100 attempts, at least 25 strains of *T. foetus* have been apparently separated from bacteria by migration. Bacteria-free strains of *T. foetus* were also obtained by a Petri dish modification of the Glaser-Coria technic permitting lateral migration only. Saline-egg-blood medium was used for culture maintenance. Complicated isotonic salines gave no advantage over unbuffered 0.7 percent NaCl solution as covering solutions. Defibrinated blood may be replaced by serum, erythrocytes or egg white. Loeffler's serum or liver infusion slants may be

[5] Jour. Expt. Med., 51 (1930), No. 5, pp. 787–806, pl. 1.

substituted for the whole egg slants. Serum-dextrose broth was used as the medium for experimental purposes. It was found that a variety of types of serum, human ascitic fluid, or coagulated egg albumin could be used in place of rabbit serum. At 37° C., S. E. B. medium maintained a lighter growth of organisms for a longer time (about a month) whereas S. D. B. supported a much heavier production of flagellates but for a shorter time (less than a week). The longevity of both types of cultures is increased by growing them at room temperature. Inasmuch as the S. D. B. medium requires 1,000 or more organisms per cubic centimeter of culture medium for successful inoculation, and whereas growth proceeds in S. E. B. medium from less than 10 organisms per cubic centimeter, the latter medium was found more dependable for routine purposes."

**Tularemia in a beaver,** H. L. Hammersland and E. M. Joneschild (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 754, pp. 96, 97, fig. 1*).—Report is made of the necropsy of a beaver in Montana, followed by bacteriological cultures and animal injections, which led to the diagnosis of tularemia, due probably to water-borne infection. This is thought to be the first record of tularemia in a beaver. It was found that the beaver had been living in stagnant water and that the beaver population was considerably larger than it should have been in the area where the disease appeared.

**Natural occurrence of tularemia in beaver and its transmission to man,** J. W. Scott. (Univ. Wyo.). (*Science, 91 (1940), No. 2359, pp. 263, 264*).—Report is made of the finding of tularemia in the beaver in Wyoming in April 1939, its transfer by inoculation to the rabbit, and its natural transmission to man. It is suggested that the beavers among which there had been a considerable mortality may have become infected through fleas by feeding in nearby alfalfa meadows inhabited by rabbits, or the infection might have been waterborne as suggested by Hammersland and Joneschild, as above noted.

**Worm-host systems as labile mechanisms: A view of the nematode-ruminant problem,** N. R. Stoll (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 756, pp. 305–308*).

**The control of Bang's disease in an experimental herd of range cattle,** H. Marsh and H. Welch. (Mont. Expt. Sta. et al.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 757, pp. 473–477, fig. 1*).—Control work with Bang's disease in range cattle in Montana led to the following conclusions: "(1) The presence of a small percentage of reactor cows in a herd which runs on the range throughout the year does not constitute a serious menace; (2) the presence of reactor cows in a range herd may be the source of a serious outbreak of Bang's disease if the cattle are fed hay during the winter; [and] (3) in a range herd where the breeding season is limited so that all the calves are born within a 60-day period, the infection can be eliminated from the herd by shipping all 1:50 reactors to two annual tests made about 4 mo. after calving is completed, even in the face of an active outbreak of the disease." The results obtained in this herd of cattle served to support the following recommendations for the control of the disease in range cattle: "(1) The breeding season should be limited to not more than 60 days, if possible. This is recognized as good practice from a production standpoint as well as for disease control. (2) All cows should be tested in the fall, 3 to 4 mo. after the last calf was born, and cows reacting with complete agglutination at 1:50 should be culled from the herd. One or more retests may be made at intervals of 1 yr. (3) As an aid in maintaining a clean herd, replacement heifer calves should be vaccinated."

**Bloat in dairy cattle,** T. M. Olson (*South Dakota Sta. Cir. 27 (1940), pp. 8*).—This practical account includes the results of a study of the kind of gases found in the rumen of affected cows. Analyses of 44 samples revealed several toxic

gases present in the rumen, of which carbon monoxide and hydrogen sulfide are toxic or poisonous in very small quantities when diffused in the blood. It is considered possible that intraruminal pressure when it reaches a given point paralyzes the rumen, preventing peristalsis of the paunch and liberation of the gases. When these toxic gases are absorbed from the rumen and diffused in the systemic blood, death may result from asphyxia or suffocation. While no infallible bloat preventive measures have been discovered, some measures are effective under certain conditions, although under what may appear to be similar conditions these same measures do not always prevent bloat. Some remedies like turpentine, kerosene, or formalin in milk or water may check or even stop the fermentation and effect a release of the gases produced. In acute cases of bloat, or the "boiling type," the gas must be released by puncturing the rumen. It sometimes is necessary to remove part of the rumen contents to check fermentation.

**Studies on mastitis in dairy cows** (*Jour. Council Sci. and Indus. Res. [Austral.], 13 (1940), No. 1, pp. 19–23*).—This summary of investigations conducted during the first two lactation periods of an experimental herd, commenced in 1935, deals with (1) the establishment and management of the herd, (2) bacteriological, cytological, and clinical investigations, (3) the laboratory methods, cultural, serological, and cytological, used in the investigation, and (4) the results obtained.

**The control of chronic streptococcus mastitis,** F. C. MINETT (*Jour. Compar. Pathol. and Ther., 52 (1939), No. 4, pp. 266–272*).—This contribution is based upon observations made of a small herd lightly infected with streptococcus mastitis, extending over a period of 2 yr. The control of the disease is discussed in a general way.

**A case of so-called reticulo-endotheliosis in cattle** [trans. title], J. EGEHØJ (*Skand. Vet. Tidskr., 30 (1940), No. 2, pp. 141–160, pl. 1; Eng. abs., p. 158*).—A detailed account is given of the alterations of the blood and organs in a case of generalized lymphadenosis in a cow. The findings have led to the conclusion that the disease is identical with so-called lymphocytomatosis in cattle. A list of 69 references to the literature is included.

**Tuberculous synovitis in bovines resulting from the intravenous injection of avian tubercle bacilli,** A. B. CRAWFORD and A. H. FRANK. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 757, pp. 459, 460, figs. 3*).—In the experiments reported 6 of 10 yearling bovines that were inoculated intravenously with strains of avian tubercle bacilli recovered from swine succumbed to tuberculous pneumonia within 2 mo. "Of the remaining 4 animals, 2 developed swellings in various joints of the extremities about 8 mo. after inoculation. Avian tubercle bacilli were recovered from the synovial fluid in the affected joints. These 2 affected animals became progressively emaciated, 1 dying 2½ yr. after inoculation and the other being killed in a weakened condition about 3 yr. after inoculation. The joint enlargements were found to be due to a thickening of the synovial membrane and capsule, there being no evidence of ankylosis or bone destruction. There was no evidence of organic tuberculosis in these 2 animals."

**Duration of immunity induced in calves by BCG.—II, Resistance induced by multiple doses of the vaccine,** J. B. BUXTON, R. E. GLOVER, T. DALLING, and T. J. BOSWORTH (*Jour. Compar. Pathol. and Ther., 52 (1939), No. 4, pp. 273–300, figs. 3*).—In continuation of this study (E. S. R., 76, p. 849), the authors report that when B. C. G. is given intravenously at 6-mo. intervals in doses of 50 or 100 mg. it is well tolerated by cattle. Of 8 calves which had been vaccinated regularly at 6-mo. intervals for a period of 3 yr., 5 were completely

resistant to an oral administration of virulent tubercle bacilli which produced extensive local and slight generalized tuberculosis in unprotected controls. In the remaining 3 no macroscopic lesions were found in 1, while in 2 the tuberculous changes were slight. The resistance induced by the repeated inoculation of B. C. G. over a period of 3 yr. was overcome by continued exposure to infection immediately after the first dose of vaccine or after a lapse of 18 mo. In 28 animals 10 were completely free from tuberculosis, 14 showed slight or moderate lesions, while 4 were severely affected. Distinct fluctuations in the sensitivity to tuberculin were observed during the course of vaccination with B. C. G. In general each reinforcing dose tended to augment the skin sensitivity, but the stimulus was less apparent with successive doses of the vaccine. In a proportion of vaccinated animals, which showed no visible lesions at post mortem, virulent organisms were obtained from various lymphatic glands by guinea pig inoculation.

**Lead-arsenate poisoning of sheep and cattle**, E. C. McCulloch and J. L. St. John. (Wash. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 756, pp. 321–326, fig. 1*).—The fatal poisoning and loss of nearly all of a flock of some 1,000 sheep near Orondo, Wash., which had fed on the foliage beneath apple trees that had been sprayed with lead arsenate is first reported upon. Reference is also made to the loss of 23 feeder steers at Zillah, Wash., that had fed in a pear and apple orchard that had been sprayed. In tests conducted sheep died when "experimentally fed sufficient lead arsenate that they obtained arsenic equivalent to approximately 2 gm. (31 gr.), expressed as $As_2O_3$. Analyses of the rumen contents of animals poisoned from eating lead-arsenate-sprayed forage, however, indicated that much greater amounts of arsenic had been consumed. The possibility that the lead and arsenic were converted to some less toxic form is suggested. The lowered toxicity may be the result of decreased solubility within the digestive tract. The darkening of the bone marrow observed in some of the lead-arsenate-fed sheep supports the suspicion that the feeding of arsenic-containing compounds may be responsible for the condition known as 'black cutters.'"

A review of the literature includes a list of 22 references.

**The helminth parasites and parasitic diseases of sheep in Canada.—I, A survey and some preliminary studies on existing problems**, W. E. Swales (*Canad. Jour. Res., 18 (1940), No. 1, Sect. D, pp. 29–48, figs. 11*).—Report is made of investigations of the identity, incidence, economic importance, and seasonal fluctuations of the helminth parasites in the alimentary canal of sheep in Canada, with particular consideration to problems in Quebec and eastern Ontario. Haemonchiasis, due to *Haemonchus contortus*, is said to be the parasitic disease of eastern Canada during the summer months, and is replaced by trichostrongylosis, oesophagostomiasis, and possibly hookworm disease in the late autumn and winter. Haemonchiasis and chabertiasis were recorded in British Columbia.

A list of 15 references to the literature is included.

**The effect of copper sulfate and ferric sulfate on coccidial oöcyst output in feeder lambs**, J. F. Christensen. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 757, pp. 478, 479, 480, fig. 1*).—The result of a test conducted is offered as confirmation of the observation of Spindler (E. S. R., 81, p. 574) that the administration of a copper sulfate-ferric sulfate in some manner reduced the average oocyst output in spring lambs in Maryland, and "is not intended to indicate that a similar procedure will effectively control coccidiosis in feeder lambs. It is strongly indicated from these tests, however, that the effect of these chemicals on oocyst output should be tested with larger numbers of lambs under actual feed lot conditions of sanitation,

population, and nutrition. Should such experiments demonstrate the same reduction in oocyst discharge for large lamb populations as was noted here for small numbers, it is possible that the use of a copper sulfate-ferric sulfate mixture, preferably mixed as a powder with feed, would prove to be a valuable supplement to proper nutrition and management in eliminating the ever-present danger of outbreaks of clinical coccidiosis."

**Intestinal paramphistomiasis of sheep in Sind.—A preliminary report,** H. S. Bawa (*Indian Jour. Vet. Sci. and Anim. Husb., 9 (1939), No. 4, pp. 425–429*).—A report is made of the outbreak of a disease among sheep investigated and found to be associated with immature forms of amphistome flukes.

**Studies on Thysanosoma actinioides,** F. X. Gassner and F. Thorp, Jr. (Colo. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 756, pp. 410, 411, figs. 3*).—Report is made of the observation of the tapeworm *T. actinioides*, which though but slightly if at all pathogenic for feed lot lambs, is of importance in that the livers of infested lambs are condemned.

**Ovine thelaziasis,** M. A. Stewart. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 757, pp. 486–489, 490*).—The finding by the author of the nematode *Thelazia californiensis* (Price) in the eyes of sheep in Sonoma County, Calif., the receipt of specimens from the eyes of a buck deer (*Odocoileus hemionus* subsp.) in Sequoia National Park of that State, and the absence of infestation in dogs closely associated with infested sheep are considered to very strongly suggest that this worm is normally a parasite of herbivorous mammals and only accidentally a parasite of dogs, as it is of man. It is considered quite likely that the parasite will be picked up in cattle and possibly also in horses. It is thought that the association of thelaziasis and infectious keratitis was merely a coincidence, but it is possible that the worms may act as a predisposing factor in the latter affection.

**California mule deer a host for nematode eye worms in Sequoia National Park,** F. R. Oberhansley (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 757, p. 542*).—Record is made of the securing of a number of nematode eye worms (*Thelazia californiensis*) in the eyes of a mature buck deer in Sequoia National Park in December 1939, as mentioned above. "From the time this buck was first observed until December 17, his general condition became progressively worse to the point of extreme emaciation."

**Studies on phenol tolerance of Erysipelothrix rhusiopathiae,** C. N. Dale. (U. S. D. A.). (*Jour. Bact., 39 (1940), No. 2, p. 228*).—A strain of the swine erysipelas bacterium *E. rhusiopathiae* in hog cholera virus blood was found to have survived for at least 99 days after phenol had been added, although other bacterial contaminants present at the commencement of this period did not. Using phenolized defibrinated blood as a medium, cultural tests showed that the strain used would multiply in 24 hr. when seeded in the medium containing 0.5 percent phenol and incubated at room temperature. "Tests also showed that the same concentration of phenol in this medium had a definite bacteriostatic and bactericidal action on other bacterial contaminants which had been found in the hog cholera virus blood. These tests suggest that the presence of the swine erysipelas organism in hog cholera virus blood may be detected by culturing it daily while held at room temperature. Using the above tests as a basis, it was found that this strain of *E. rhusiopathiae* would multiply in beef infusion broth to which phenol had been added in a proportion of 0.25 percent. By use of this medium *E. rhusiopathiae* was isolated from tonsils of swine which, by pigeon inoculation tests, had been shown to harbor this organism. The following procedure was used: Unphenolized beef infusion broth was inoculated with a portion of triturated tonsil, which was incubated for 24 hr. at 37.5° C. A loopful of the

mixed culture was then transferred to 0.25 percent phenolized broth and incubated at room temperature. When a loopful of the phenolized broth culture was spread over the surface of serum agar medium, isolated colonies of the swine erysipelas organism developed."

**Listerella infection in swine,** H. E. Biester and L. H. Schwarte. (Iowa State Col.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 756, pp. 339–342, figs. 2*).—Report is made of *Listerella* infection in swine, based upon a review of the literature and the results of experimental infection, in continuation of the earlier work with the disease as met with in sheep (E. S. R., 82, p. 255). A Gram-positive variety of *Listerella* was isolated by the authors from cases of porcine listerellosis characterized by varying degrees of incoordination, trembling, and a peculiar accentuated "stilted" gait of the forelegs. The temperature may be elevated. In small suckling pigs the incoordination associated with general weakness does not present the picture of a specific disease. The disease is of "considerable interest from the standpoint of diagnosis and pathology because the cellular reactions produced by the *Listerella* organism are similar to the changes described in connection with certain virus diseases, especially those of 'louping ill' of sheep. The virus of hog cholera is also capable of producing similar perivascular infiltrations in the central nervous system. In porcine listerellosis no specifically diagnostic gross lesions were found. Until more is known about this group of infections, sick animals should be isolated and placed in comfortable quarters and nursed to avoid complications."

**Investigations on trichinosis in Canada.—III, On the incidence of trichinosis in garbage-fed hogs,** T. W. M. Cameron (*Canad. Jour. Res., 18 (1940), No. 3, Sect. D, pp. 83–85*).—In this further work (E. S. R., 82, p. 257) in which 995 garbage-fed hogs from the Provinces of Quebec, Ontario, and Manitoba were examined, only 2 were found to harbor trichina larvae.

**Phenothiazine as an anthelmintic for the removal of intestinal worms from swine,** L. E. Swanson, P. D. Harwood, and J. W. Connelly. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 756, pp. 333–338*).—When administered to pigs as an anthelmintic in continuation of earlier work (E. S. R., 81, p. 105) phenothiazine seemed to be as effective for the removal of mature ascarids as oil of chenopodium, with the exception of cases in which only a few are present. It is the only known medicament that is effective for the removal of nodular worms from swine. "Phenothiazine possesses several practical advantages over previously known anthelmintics, as follows: It has a low toxicity, greater efficacy in heavily infested than in lightly infested animals, ease of administration, and anthelmintic activity against more than one species of worm parasite. On the other hand, its low efficacy in removing ascarids when but few worms are present is a decided disadvantage. Recrystallized phenothiazine is more effective as an anthelmintic than conditioned phenothiazine, which has been proposed for use as an insecticide. Although further investigations of phenothiazine as an anthelmintic for use in swine are necessary, a table of dosages intended for experimental use is given."

**The "blood picture" of the horse,** J. Stewart and H. H. Holman (*Vet. Rec., 52 (1940), No. 9, pp. 157–165, figs. 2*).—Details of studies are given in tables.

**The rôle of mineral deficiency in equine abortion,** V. R. Rajagopalan (*Indian Jour. Vet. Sci. and Anim. Husb., 9 (1939), No. 4, pp. 415–424*).—In an outbreak of abortion which occurred on the army stud farm at Ahmednagar, it was found that *Salmonella abortivoequina* (*abortus equi*), the common cause of infectious abortion in mares, was not involved. The evidence obtained indicated a mineral deficiency, particularly of calcium, as the cause. A list of 14

references to the literature is included, and the results of agglutination tests of the blood of the mares and stallions are given in an appendix.

**The differential diagnosis of botulism and western type infectious encephalomyelitis in horses,** C. M. HARING. (Univ. Calif.). (*Vet. Bul. Lederle, 8 (1939), No. 4, pp. 65–70, figs. 8; abs. in Vet. Digest, 2 (1940), No. 1, pp. 6, 7*).

**Vaccination of man against the virus of equine encephalomyelitis (eastern and western strains),** J. W. and D. BEARD and H. FINKELSTEIN (*Jour. Immunol., 38 (1940), No. 2, pp. 117–136*).—The results of the vaccination of a group of 100 human adults with a bivalent crude formolized chick embryo vaccine similar to that employed in the protection of horses against both eastern and western types of the equine encephalomyelitis virus are reported. The findings, together with a consideration of the demonstrated prevalence of subclinical and clinical infections with both strains of virus, are considered to constitute emphatic indications for the vaccination of individuals that are frequently exposed to the virus.

**The serological classification of Corynebacterium equi,** D. W. BRUNER, W. W. DIMOCK, and P. R. EDWARDS. (Ky. Expt. Sta.). (*Jour. Infect. Diseases, 65 (1939), No. 1, pp. 92–96*).—It is pointed out that *C. equi*, an etiologic agent of pneumonia in foals, offers some difficulty in classification because of its comparative biochemical inactivity. In the work reported it was shown to possess species specific antigens which are demonstrable by complement-fixation tests but not apparent in other species of diphtheroids used for comparison. Type specific antigens may be demonstrated by agglutination tests, or by precipitation tests in which acid extracts of the bacilli serve as antigens. Fourteen of the 20 cultures studied belong to 2 main serologic types. Cultures from the genital tract of mares, from aborted equine fetuses, and from pneumonia of foals belong to the same serologic type. Cultures from hogs and buffaloes were demonstrated to be members of the species, indicating that *C. equi* may attack a variety of domestic animals.

**The incidence of intestinal parasitism in Philippine horses with special reference to strongylosis,** Z. DE JESUS and J. B. UICHANCO (*Philippine Jour. Anim. Indus., 6 (1939), No. 6, pp. 435–447, pls. 3*).—The investigation reported has shown the incidence of intestinal worm infestation in Philippine horses of all ages to be 94.83 percent. "Of the parasites that are of common occurrence, the *Strongylus* spp. have an incidence of 93.19 percent, the *Trichonema* spp. 29.57 percent, the *Ascaris equorum* 15.96 percent, the *Oxyuris equi* 8.21 percent, and the *Anoplocephala perfoliata* 1.4 percent. . . . The incidence of worm infestation in horses from a few months to 2 yr. old is 95.12 percent, in those from 3 to 7 yr. old 95.36 percent, and in those from 8 to 12 yr. old 98.24 percent. . . . Since there is a decidedly negative correlation of the incidence of *Ascaris* infestation to the age of the hosts, the coefficient of correlation being $-0.8474 \pm 0.0103$, it is clearly shown in this study that young horses or foals are susceptible to ascariasis whereas the older horses are naturally resistant to this parasitic disease. There is no evidence whatever of the correlation of *Strongylus* infestation to the age of the hosts, the coefficient of correlation being $-0.0626 \pm 0.6718$, showing that horses of all ages are susceptible to strongylosis. In both ascariasis and strongylosis the incidence does not vary according to the sex of the hosts. Actual observations have shown that in heavy infestation strongylosis could be the direct cause of death of horses ranging in ages from 1 to 2 yr. even in the presence of sufficient good feed and under proper care. Young horses heavily infested with *Strongylus* spp. developed a prominent edematous swelling over the epigastric and umbilical regions."

**Pneumonyssus caninum n. sp., a mite from the frontal sinus of the dog,** W. L. CHANDLER and D. S. RUHE. (Mich. Expt. Sta.). (*Jour. Parasitol., 26 (1940), No. 1, pp. 59–70, figs. 18*).—Under the name *P. caninum*, a description is given of a new mite, a considerable number of which were found in the frontal sinuses of a dog autopsied at the station.

**Changes in the virulence of distemper virus on fur animal ranches,** R. G. GREEN. (Univ. Minn.). (*Skand. Vet. Tidskr., 29 (1939), No. 12, pp. 1227–1231; Sw. abs., pp. 1230, 1231*).—Following a brief general discussion and a consideration of the normal type of distemper virus, investigations of natural strains of partially modified virus and distemper modified in foxes and in minks are reported upon and the variation in symptoms and the effect of secondary invasion dealt with.

**Immunological and histological studies on mink distemper,** H. PINKERTON (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 756, pp. 347–355*).—An epizootic disease of mink identified by histological studies as a form of distemper is described clinically and shown to be probably more closely related to canine distemper than to the strain of ferret distemper described by Slanetz and Smetana (E. S. R., 78, p. 696). "Two reasons for the inadequacy of commercial canine distemper antiserums and vaccine, prepared from the blood or tissues of dogs, in controlling epizootics of distemper in minks are pointed out. This strain of mink distemper was readily transmissible to the ferret and produced a uniformly fatal infection in that animal. The mortality in young minks without treatment was 100 percent, and the susceptibility of young minks is probably high. The mortality in adult minks does not exceed 50 percent, and the susceptibility of adult minks is relatively low. A method of vaccinating minks with tissue vaccine, prepared for use on each ranch from animals dying on that ranch, is described. Apparently excellent empirical results from the use of this vaccine on nine mink ranches are reported. Some evidence is introduced that the vaccine used had curative effects if given in the early stages of the disease to young minks, since at least 21 young minks survived under these conditions, as contrasted with a natural mortality of 100 percent. Minks apparently die from infection with distemper virus alone, in contrast to foxes, in which secondary bacterial infections play an important role. Epizootiological data, showing the variable results of placing exposed foster kits in healthy litters, are given. Tissue vaccine prepared from mink tissue infected with mink distemper was partially effective in protecting ferrets against this same strain of mink distemper, causing marked prolongation of the incubation period and a reduction of the mortality from 100 percent to 50 percent.

"Commercial canine distemper tissue vaccine, prepared from the spleens of dogs suffering from canine distemper, was completely ineffective in protecting ferrets against mink distemper. A minute spiral organism, similar to the etiological agent of bovine pleuropneumonia and also to the organism described by Shoetensack as the cause of distemper in dogs, was cultured from the tissues of one mink. This organism was capable of producing neither symptoms of nor immunity to mink distemper when injected into ferrets. The importance of finding inclusion bodies, as a rapid and accurate method for diagnosing distemper, is stressed."

**Anthrax in minks,** G. W. STILES and C. L. DAVIS. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 756, pp. 407–409, figs. 2*).—A report is made of an outbreak of anthrax in mink that occurred in the region of Denver, Colo., and which resulted in the death of 16 animals in 3 ranches representing 622 head. "The definite source of the infection was not determined, although some of the meat fed the minks was suspected as the probable cause. The meat

used came from jack rabbits, horses, and cows. Some of the horses and cows were known to be sick at the time of slaughter, yet their meat was fed to valuable fur-bearing animals."

**Poultry practice**, L. D. BUSHNELL ET AL. (*Chicago: Vet. Mag. Corp., 1940, pp. 160, figs.* [79]).—This is a collection of 34 articles relating to diseases and parasites and their treatment and control, prepared by many authors, most of which have been noted (E. S. R., 82, p. 826).

**[Report of work in avian pathology in western Washington]** (*Western Washington Sta. Rpt. 1939, pp. 51–53*).—Reference is made to work of the year (E. S. R., 81, p. 424) on pullorum disease transmission and erysipelas in turkeys, both by C. E. Sawyer and C. M. Hamilton; and leucosis in chickens, by Hamilton.

**Practical health control measures in poultry husbandry**, J. R. BEACH. (Univ. Calif.). (*U. S. Egg and Poultry Mag., 46 (1940), No. 2, pp. 90, 91, 127*).

**Many chick losses are due to faulty ventilation**, G. W. STILES. (U. S. D. A.). (*Poultry Tribune, 43 (1937), No. 3, pp. 8, 62–64, fig. 1*).

**Carbon monoxide poisoning of chicks and poults in poorly ventilated brooders**, G. W. STILES. (U. S. D. A.). (*Poultry Sci., 19 (1940), No. 2, pp. 111–115*).—Investigations conducted in the Denver area over a period of years in continuation of studies previously noted (E. S. R., 75, p. 827; see also above) are reported. The author is led to the conclusion that inadequate ventilation of brooders causes a high percentage of undetermined poultry losses and is of equal importance with pullorum disease. "Experimental gassing of 30 three-week-old chicks in an atmosphere of approximately 0.4 percent gas, with carbon dioxide removed, showed varying tolerance to carbon monoxide. In a similar lot exposed to 0.8 percent carbon monoxide, without removal of carbon dioxide, the first 2 died after 14 min., with others dying at frequent intervals until after 60 min. 8 survived. In a series of 436 chicks examined for both pullorum disease and carbon monoxide poisoning during a 6-mo. winter period, 212 (48.6 percent) were positive for carbon monoxide and 224 (51.4 percent) for pullorum disease."

**Indoor-hen-battery mortality**, M. W. EMMEL. (Fla. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 756, pp. 372–374*).—Studies of the paralysis, lukemia, and emaciation which result from indoor-hen-battery conditions and have caused losses ranging from 20 to 60 percent of the hen-battery population are reported. An examination of the blood of hens confined in indoor-battery plants has shown that hemocytoblastosis occurs in all birds which have been housed in the plant more than a month.

**Symposium on avian lymphomatosis and allied diseases** (*Poultry Sci., 19 (1940), No. 2, pp. 83–105*).—Contributions presented at a symposium in connection with the Seventh World's Poultry Congress held in Cleveland, Ohio, in August 1939 and not previously noted (E. S. R., 82, p. 257) are: Avian Lymphomatosis as a Neoplastic Disease, by K. B. DeOme (pp. 83–90) (Univ. Calif); Discussion of Papers Entitled "Avian Lymphomatosis as a Neoplastic Disease" by K. B. DeOme, "Fowl Leukosis" by E. L. Stubbs, and "Hemocytoblastosis in the Chicken" by M. W. Emmel, by C. Olson, Jr., (pp. 92, 93) (Mass. State Col.); Discussion of M. W. Emmel's Paper on "Hemocytoblastosis in the Chicken," by E. Jungherr (pp. 93, 94) (Univ. Conn.); Wheat Germ Oil in the Control of Fowl Paralysis, by E. Jungherr (pp. 94–99) ([Conn.] Storrs Sta.), with discussion by L. C. Norris (pp. 100–102) (Cornell Univ.); and Discussion of Paper by J. H. Martin Entitled "Heredity and Avian Lymphomatosis," by K. B. DeOme (p. 105) (Univ. Calif.).

**[Work with fowl paralysis]**, J. H. MARTIN (*Poultry Tribune, 46 (1940), No. 2, pp. 50–52, figs. 4*).—A brief report is made of the progress of work under way at the Regional Poultry Research Laboratory at East Lansing, Mich. (E. S. R., 82, p. 292).

**Wheat germ oil in fowl paralysis,** E. P. Johnson. (Va. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 756, pp. 375, 376*).—Experiments conducted are said to have shown that there is no pathological ground for assuming a specific antileucotic property of wheat germ oil.

**The occurrence of a Gram-positive coccus in birds positive to the serum plate test for pullorum disease,** R. H. Hurt and E. C. McCulloch. (Wash. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 757, pp. 503–506*).—The authors report having isolated a Gram-positive coccus from birds whose serums gave reactions to the serum plate test for pullorum disease. "In the test approximately 59 percent of a group of 121 New Hampshire Reds gave reactions in dilutions of 1 : 100 and 1 : 200. Of a group of 27 Rhode Island Reds 26 percent gave reactions in the same dilutions, and 17 percent of a group of 141 White Leghorns gave similar reactions. Of these reactions approximately 75 percent were complete and the other 25 percent were incomplete or suspicious. *Salmonella pullorum* or any related Gram-negative organism could not be isolated from these birds. It was found that in this case the rapid whole-blood test did not substantiate the rapid serum plate findings in all cases. The isolation of the coccus from the various organs . . . and from the eggs and chicks of reactor hens suggests the possibility of transmission through the egg. The majority of the chicks showed a definite omphalitis."

**The influence of Salmonella species on the whole blood pullorum test,** A. R. Winter and R. Nadal. (Ohio State Univ.). (*Poultry Sci., 19 (1940), No. 2, pp. 143–146*).—*S. gallinarum, S. aertrycke, S. enteritidis, S. paratyphi, S. schottmuelleri, S. suipestifer*, and *S. anatis* were highly pathogenic for day-old chicks when inoculated intraperitoneally but much less pathogenic for older birds. Vaccination with fowl typhoid and mixed cholera-typhoid bacterins interfered with the whole blood pullorum test for at least 2 weeks after a single vaccination. Broilers infected with *S. gallinarum, S. aertrycke, S. enteritidis, S. paratyphi*, and *S. schottmuelleri* reacted to the whole blood pullorum test 7 days after inoculation. The agglutinations were characteristic of the pullorum reaction. Broilers infected with *S. suipestifer* and *S. anatis* reacted to the standard tube test when tested with homologous antigen, but not with pullorum antigen or the whole blood pullorum test.

**The important helminth parasites of poultry: Their treatment and control,** H. D. Srivastava (*Indian Jour. Vet. Sci. and Anim. Husb., 9 (1939), No. 4, pp. 393–409, pls. 3*).

**Studies in helminthology: Trematode parasites of birds,** M. B. Lal (*Indian Acad. Sci. Proc., 10 (1939), No. 2, Sect. B, pp. 111–200, figs. 20*).—The results of studies of the morphology and classification of avian trematodes from India are presented with a list of 173 references to the literature.

**A note on the problem of acquired immunity to argasid ticks,** W. Trager (*Jour. Parasitol., 26 (1940), No. 1, pp. 71–74*).—Chickens that had been repeatedly infested with nymphs and adults of the fowl tick did not show any immunity to these stages of the ticks, which engorge in from 5 to 10 min. The chickens did, however, exhibit a partial immunity to the larvae, which require at least 4 days for engorgement. Guinea pigs exposed to repeated infestation with *Ornithodoros venezuelensis*, all stages of which engorge rapidly, showed no immunity to any of the stages of this tick.

**The food of the fowl nematode Ascaridia lineata (Schneider),** J. E. Ackert, J. H. Whitlock, and A. E. Freeman, Jr. (Kans. Expt. Sta.). (*Jour. Parasitol., 26 (1940), No. 1, pp. 17–32, fig. 1*).—In experimental studies of the food of the fowl nematode *A. lineata*, comparisons were made of the numbers and lengths of *A. lineata* from chickens nourished only by water per os and intra-

muscular glucose injections with the worms from chickens of the same age that were fed normally. "Injections of 25 percent glucose in Locke's solution at 8-hr. intervals were the most successful in prolonging the lives of the injected fowls. The results from 237 chickens showed that the worms thrived markedly better in normally fed chickens than in those nourished only by the glucose injections. In fact, the *A. lineata* from the controls made normal growth while those from the glucose-injected chickens made little growth after normal feeding of the fowl ceased. After considering various factors which might arise in the small intestines of the injected chickens and which might become detrimental to the worms, the writers are of the opinion that the fewer and shorter nematodes in the experimental chickens were due to partial starvation. The results of the experiments indicate that the food of the fowl nematode *A. lineata* consists mostly of host ingesta." There are 24 references to the literature.

**Intermediate hosts of chicken tapeworms found in Kansas**, A. A. CASE and J. E. ACKERT. (Kans. Expt. Sta.). (*Kans. Acad. Sci. Trans., 42 (1939), pp. 437–442*).—Of 10 species of fowl tapeworms reported from the United States, 6 have been found in chickens in Kansas, namely, *Raillietina cesticillus* (Molin 1858), *Choanotaenia infundibulum* (Block 1779), *R. tetragona* (Molin 1858), *Hymenolepis carioca* (Magalhaes 1898), *R. echinobothrida* (Megnin 1880), and *Amoebotaenia sphenoides* (Railliet 1892). Three species of beetles are recorded for the first time as intermediate hosts of the chicken cestode *C. infundibulum*, namely, *Amara fallax* Lec., *Anaferonia constricta* Say, and *Tenebroides mauritanicus* (L.). A list is given of 22 references to the literature.

**Pseudomonas infection in turkeys**, H. J. STAFSETH, W. MACK, and J. F. RYFF. (Mich. Expt. Sta.). (*Poultry Sci., 19 (1940), No. 2, pp. 126–130*).—An investigation made in the fall of 1938 of an outbreak of disease in approximately 19,000 turkeys with a morbidity rate of nearly 50 percent and a very low mortality led to the isolation of a hemolytic pseudomonas in pure culture from the heart and liver of a recently dead turkey. Stained smears from the heart blood and liver showed numerous pleomorphic, at times granular or irregularly stained rods. The organism was found to resemble closely *Pseudomonas aeruginosa*. The literature relating to pseudomonas infection is briefly reviewed, characteristics of the pseudomonads considered, and the avenue of infection, symptoms, postmortem observations, and the isolation of the organism reported upon. The organism is considered to differ sufficiently from *P. aeruginosa* and also from *P. jaegeri* to warrant the description presented. It was found to be pathogenic for turkeys, chickens, pigeons, rabbits, guinea pigs, rats, and mice.

**Pullorum in poults threat to growers**, F. THORP, JR., and G. S. HARSHFIELD (*Colo. Farm Bul.* [*Colorado Sta.*], *2 (1940), No. 2, pp. 16, 17*).—The importance and nature of this disease and means for prevention are considered.

**A case of Collyriclum faba infestation in a purple finch**, F. R. BEAUDETTE. (N. J. Expt. Stas.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 756, pp. 413, 414*).—A brief review of the records of infestation of fowl by the fluke *C. faba*, with references to the literature, is followed by a report of the infestation of a purple finch from Demarest, N. J., by two.

## AGRICULTURAL ENGINEERING

**[Agricultural engineering investigations of the Missouri Station]** (*Missouri Sta. Bul. 413 (1940), pp. 13–15, fig. 1*).—Work on size, depth, and spacing of tile drains for Missouri soils is reported upon by J. C. Wooley; electric brooding of chicks and operating costs of electric fence controllers, both by M. M. Jones and W. A. Junnila; contour furrowing for pastures (this work including the design of a furrowing machine to build furrows without losing sod or exposing

subsoil and a draft sufficiently low so that an ordinary farm tractor may be used for power), by Wooley, Jones, and X. McNeal; seedbed preparation studies, by Jones and McNeal; and the effect of environment on laying hens, by Wooley and E. M. Funk.

**[Agricultural engineering investigations of the Washington Station].** (Partly coop. U. S. D. A. et al.). (*Washington Sta. Bul. 384 (1939), pp. 11, 12, 80, 81*).—The use of electricity in Washington agriculture is reported upon by L. J. Smith and H. L. Garver, including data on heating hotbeds with electric cable and poultry house lighting. Cold-storage investigations (including studies of the community locker type cold-storage plants) are noted by Smith. Time of irrigation and the quantity of water used, and methods of irrigation are briefly discussed by H. G. Nickle.

**Rainfall and discharge records for northern Iowa drainage districts,** W. J. Schlick (*Iowa Engin. Expt. Sta. Bul. 141 (1939), pp. 72, figs. 44*).—This study of rainfall and drainage discharge was undertaken (1) to determine the rates of run-off for which drainage districts in northern Iowa should be designed and (2) to study the changes which extensions of farm-lateral systems produce in the discharge characteristics of such districts. The field data include rainfall and discharge records for each season, April to October inclusive, in the 13-yr. period, 1920–32, for three districts with drainage areas of 12, 25, and 35 sq. miles (including two tile-lateral areas of 4.5 and 1.25 sq. miles), the dredged channel for the west fork of the Des Moines River with a drainage area of 2,190 sq. miles, and a tile district of 3.5 sq. miles without surface inlets. Frequency studies of rainfalls and of peak rates of run-off by the station-year method were also carried out, and the results were used as a basis for evaluating the discharge data.

The extensions of farm-lateral systems were found not sufficient to permit conclusions concerning their effects upon the discharges from the various districts. The data contribute to the information concerning the probable magnitudes and frequencies of maximum rainfalls and discharges from drainage districts and the frequencies, volumes, and durations of excesses in discharge above selected design rates of run-off.

**Rubber-tyred farm vehicles,** W. S. Lockwood (*Brit. Rubber Pub. Assoc., Rubber and Agr. Ser. Bul. 12 (1939), pp. [1]+12, figs. 6*).—The claim is made that normally one horse, mule, or other animal can readily pull on low-pressure tires what would require a pair on steel. Some other advantages noted are that ground which cannot be traversed with iron-wheeled wagons is easily crossed on rubber tires; that larger loads can be carried smoothly and speedily, with particular advantage in the handling of perishable products, livestock, etc.; that wheel maintenance charges are reduced, and the wagon itself is protected from the bad effect of jolts and jars; that the ground and grass or other cover crops are not damaged by ruts; that such equipment provides much greater comfort for the driver; that new and improved designs of wagons of lighter construction and larger capacity, incorporating a lower loading line, are practicable; and that the farm wagon can be readily converted to a tractor trailer.

**Pneumatic tractor tires,** T. E. Long (*North Dakota Sta. Bimo. Bul., 2 (1940), No. 4, pp. 9, 10*).—The author has condensed Iowa Station Bulletin 382 (E. S. R., 82, p. 546) for the use of North Dakota farmers.

**Cotton ginning equipment and practices in Tennessee,** C. E. Allred and B. D. Raskopf. (Coop. U. S. D. A.). (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 101 (1940), pp. [1]+IV+30, figs. 7*).—The number of ginneries, by years, from 1902 to 1939 and their ownership and management are given, and ginneries are classified by power used, by size and capacity, and by

such specified equipment as fans, seed-cotton driers, cleaners and extractors, distributors, type of gin, lint flues and condensers, and trampers, presses, and press boxes. Other topics taken up include preparation of cotton ginned in Tennessee, charges for ginning, improvements in ginning in Tennessee, and ginneries reported active in Tennessee, 1939. A bibliography is added.

**A homemade egg-cooler for farm use,** R. B. Thompson and C. A. Roberts (*Oklahoma Sta. Bul. 240 (1940), pp. 16, figs. 7*).—The device described is a summer egg cooler, using the evaporation of water to reduce the temperature and designed to be of value only through the hot, dry summer months. Because the cooler also provides moisture, it prevents the eggs from going stale due to evaporation of their contents when exposed to hot, dry weather. The device consists of an open framework of 1- by 4-in. slats covered with burlap, with provision for keeping the burlap saturated with water. The outside dimensions of the framework should be 36 in. wide, 36 in. high, and 33.75 in. deep to hold two egg cases and provide an adequate amount of space for a precooling tray and wire basket. It was found that burlap, with its more open weave, permitted a greater circulation of air than did other covering materials, a provision which was necessary to prevent mold from developing on the eggs.

Experimental work with the cooler showed that eggs held longer than 7 days are likely to develop a damaging mold growth. Eggs held at high and dry temperatures before storage were found to lose quality rapidly while in storage. Eggs held in the cooler before storage had much better quality after storage than eggs held in a normal temperature room.

**Farm fences,** M. A. R. Kelley (*U. S. Dept. Agr., Farmers' Bul. 1832 (1940), pp. [2]+58, figs. 64*).—This publication presents a more or less popular discussion of rail, board, stone, barbed-wire, and woven-wire fences. The advantages and disadvantages of electric fences are stated nontechnically, with the warning that the safety factors have not been thoroughly worked out and standardized. Posts of wood, metal, and concrete and their spacing are taken up, together with life of fences, cost of fencing, construction methods, lightning protection, gates and entrances, and maintenance of fences.

## AGRICULTURAL ECONOMICS

**[Investigations in agricultural economics by the Ohio Station]** (*Ohio Sta. Bimo. Bul. 203 (1940), pp. 31–35, 59, 60*).—Included are a general article by W. E. Krauss on The Responsibility of the Milk Producer to the Consumer, and a table by J. I. Falconer showing the average yields per acre in Ohio of corn, wheat, oats, hay, and potatoes by 10-yr. periods 1900–39. The table of index numbers of production, prices, and income by Falconer (E. S. R., 83, p. 116) is brought down through January 1940.

**[Investigations in agricultural economics and farm management by the Missouri Station, 1936–37]** (*Missouri Sta. Bul. 413 (1940), pp. 9–12*).—Findings not previously noted are reported as follows: (1) a brief statement, by H. M. Haag, as to the average differences of prices of hogs in the East St. Louis, Kansas City, and Chicago markets 1930–36; (2) findings, by O. R. Johnson, in a study of 103 farms each in Nodaway and Callaway Counties as to percentages of farms classified as roughage and concentrate farms, average yields per acre on each type of farm in corn equivalents, number of cow days per acre of rotation pasture provided by each type of farm, the proportion of each type of farm farmed by tenants, and the operators' intention to increase or decrease the units of production from the normal production program in 1936; and (3) a table, by B. H. Frame, comparing the general management factors in

1935 and 1936 on 55 farms from which records were obtained in both years. The farms are grouped on the basis of high, middle, and low management returns in 1935. The records were part of those obtained in a study of farm cost accounting and cost of family living on farms in the soil conservation area in Harrison County, Mo., Ringgold and Decatur Counties, Iowa, and Atchison County, Mo.

**Basic data for land classification,** P. A. Eke (*Idaho Sta. Bul. 232 (1939), pp. 4*).—This State summary includes four tables with brief discussions showing (1) by counties the acreage of privately owned, Federal, State, county, and municipal lands by kinds of land; (2) by counties the acreages of privately owned land outside of corporate limits owned by different types of owners and of farm land operated by owners and by nonowners; (3) by groups of counties the total acres of privately owned lands tax delinquent January 1934, 1935, and 1936, and the percentages of the delinquency originating by years 1928–35; and (4) the acreages of privately owned lands of different kinds in certain counties with taxes paid and delinquent for recent years.

**Farm adjustments in Montana.—Study of area IV: Its past, present, and future,** M. Clawson, M. H. Saunderson, and N. W. Johnson. (Coop. U. S. D. A. et al.). (*Montana Sta. Bul. 377 (1940), pp. 67, figs. 8*).—This second bulletin in the series (E. S. R., 81, p. 586) deals with the area included in Sheridan, Roosevelt, Daniels, and Valley (eastern part) counties. The physical environment, ownership and use of land, population, and trends in number and size of farms, acreages in crops, crop productivity, and livestock numbers are discussed for the area as a whole. More detailed discussion is included for each of the nine subareas, grouped into those with greatest specialization in wheat farming, those with moderate specialization in wheat farming, and those with approximately equal proportions of wheat farms, combination farms, and stock ranches. The needs and possibilities for adjustments, the steps needed in securing adjustments, etc., are discussed.

Appendixes described the sources of data and methods of calculating individual farm organization and income and adjustments.

**Type of farming and ranching areas in New Mexico, II,** P. W. Cockerill, B. Hunter, and H. B. Pingrey. (Coop. U. S. D. A.). (*New Mexico Sta. Bul. 267 (1939), pp. 134, figs. 15*).—This bulletin, which supplements Bulletin 261 (E. S. R., 82, p. 268), describes in detail the conditions in each of the 25 types-of-farming and ranching areas in the State and the nature of the agriculture in each area and subarea, and discusses briefly the more pressing agricultural problems and needed adjustments in each area.

**Range resources of Rich County, Utah,** L. A. Stoddart (*Utah Sta. Bul. 291 (1940), pp. [2]+30, figs. 6*).—This study is based on a range survey begun in 1927 of the national forest by the U. S. D. A. Forest Service and work on private land in 1937 and 1938 by the A. A. A. and the station. The geography, settlement, climate, soils, land ownership, population, and economic status of the county are described. Among subjects discussed are the former and present vegetation, productiveness of the range land, condition and density of vegetation, range grazing capacity, supplemental forage production, seasonal use of the range, poisonous plants, livestock production, range grazing use, and soil erosion. Suggestions are made for improving the range management in the area by "careful attention to the capacity and correct season for grazing the range; improved production methods on irrigated meadows to insure a dependable and maximum yield; and initiation of a stock breeding and management program that will result in high lamb and calf crops."

**Leasing Washington farms,** A. E. Orr (*Washington Sta. Bul. 385 (1940), pp. 39, figs. 2*).—The amount of tenancy in the State is discussed, with tables

showing the number of farms and acreage operated by tenants, by census periods 1900–35, the percentages of farms in 1930 operated by tenants, part owners, owners, and managers classified by type of farms, and the number of farms and acreages operated by tenants and part owners in 1935 in each of the four agricultural districts of the State. The most common provision in 29 farm lease forms as to reservations of landlords, guarantees of landlords, guarantees and contributions of tenants, cultural practices required of tenant, and settlement, enforcement, and termination or modification of leases are tabulated and discussed. The four principal types of leases in use—cash, crop-share, livestock-share, and manager-tenant—are described. The adaptation of the lease to fit the farm is discussed, with a table showing the investment and operating contributions made by tenant and landlord under each of the four types of lease.

**Amounts and cost of credit extended by cooperative exchanges,** R. E. Mercer and H. M. Haag (*Missouri Sta. Bul. 415 (1940), pp. 35, fig. 1*).—This study was made as to the costs of providing credit service and ways and means of reducing such costs, and to point out ways that the costs may be charged to those patrons using credit service. Data were obtained chiefly for the calendar year 1937 from 87 cooperative exchanges located throughout the State.

The average amount of receivables outstanding per exchange during 1937 was $4,470, being 23 percent of the average total assets and 34 percent of the average net worth of the exchange. The amount of receivables increased as the exchanges became larger, "but the proportion of supply sales outstanding, as measured by 'days of supply sales outstanding,' was smallest in the largest associations." Credit outstanding was more closely related to the credit policies and collection practices of the individual association than to size, geographic location, and type of business. Associations with definite credit policies had relatively less credit outstanding. The average cost of extending credit was 3 ct. per dollar of sales on credit. Of the cost, one-half was losses on bad debts, one-third interest, and one-sixth accounting and collection expenses. The average term of credit outstanding was 69 days. The amount of credit sales and the period of time receivables were outstanding accounted for most of the differences in credit expense per dollar of credit sales. The proportion of credit expense due to bad debts increased sharply as age of credit increased. Credit expenses were ½ ct. per dollar of sales and ⅞ ct. per dollar of supply sales. "In view of the relative high cost of the credit service provided by Missouri exchanges compared with that of credit available from specialized credit institutions, it seems that the exchanges should make a determined effort to divorce themselves from the credit service." As a means of making credit patrons pay for the service, the authors believe a flat charge is probably more practical than charging interest or giving a discount on cash sales.

**A farm management and cost study on 500 family-sized farms in the Louisiana sugar cane area, 1938,** W. W. McPherson and J. N. Efferson (*Louisiana Sta. Bul. 314 (1940), pp. 24*).—Data for the 1938 crop year were obtained by personal interviews as to detailed costs, returns, and physical units involved in the production of sugarcane, and as to the relation of the sugarcane enterprise to the complete farm business. The farms studied were limited to those producing 5 or more acres of sugarcane, 10 or more acres of crops, and obtaining 50 percent or more of the income from sugarcane. The use of land and tenure status of the operators are briefly described. The costs of production are analyzed by the "net cost" method, by which all farm expenses, both direct and indirect, were charged to the main enterprise and that enterprise was credited with all small miscellaneous sources of income, and by the "direct allocation" method, in which the main enterprise was charged with all the direct expenses and the various indirect expenses were allocated in proportion

to the use on the main enterprise. An analysis is made of the relation of size of business, yields per acreage of sugarcane and proportion of crop acres in sugarcane to costs, and of cost of producing sugarcane to returns from the enterprise and from the farm business as a whole.

The average size of the farms was 150 acres, of which about 41 acres were in sugarcane and 45 acres in other crops, chiefly corn and minor truck crops. The receipts from sugarcane averaged about 90 percent of all receipts. With the net cost method the average receipts per ton of sugarcane were $2.73 from cane sold, 95 ct. from A. A. A. payments, and 50 ct. for other crops, livestock, and livestock products sold. The average cash cost of production was $2.81 per ton. Special costs—operator's time, family labor, rent, interest, and depreciation—averaged $1.98 per ton. With the direct allocation method the total returns per ton of sugarcane were $3.72 and the total costs $2.90. "The larger the size of business, as measured by total acres in crops, the lower were the costs of producing sugarcane. . . . The higher the yield per acre, the lower were the costs per ton, regardless of the size. . . . The larger the proportion of the cropland in sugarcane, the lower were the costs, regardless of the size of business or the yield per acre of cane."

**Some results of a farm management survey in Rapides, Union, Claiborne, and DeSoto Parishes, 1938**, J. N. Efferson (*Louisiana Sta. Bul. 317* (*1940*), *pp. 16, fig. 1*).—Information regarding farm inventories, receipts and expenses, and cropping practices were obtained by visits to 118 farms in the four parishes. An analysis is made of land use, crops grown, crop yields, number of livestock, capital invested, farm receipts, expenses and returns, farm privileges, labor income, and labor earning for all farms and by parishes.

The farms averaged 146 acres, of which 60.1 acres were in all crops, 18 acres being in cotton. The total receipts averaged $1,510, of which $476 was for cotton and cottonseed, $108 for other crops, $545 for livestock and livestock products, and $381 from A. A. A. payments, increase in capital, and other income. The value of farm privileges in the four parishes varied from $545 to $558, average $553. The average labor incomes and labor earnings in the parishes were Rapides $133 and $678, Union $36 and $593, Claiborne —$107 and $441, DeSoto $174 and $734, and all parishes $57 and $610. Forty-two farms had labor earnings of from $1 to $500, 38 from $501 to $1,000, and 23 from $1,001 to $2,000 or over. Fifteen farms showed minus earnings. Average labor income increased from —$9 for the farms with less than 40 acres in crops to $190 for those with 70 acres or more, and were $1 for farms with average yields of less than 200 lb. of lint cotton per acre, $92 with yields of 200–299 lb., and $97 with yields of 300 lb. or more. The average labor incomes and labor earnings were —$35 and $446 for farms with less than 15 acres of cotton and less than 5 dairy cows, $210 and $757 with less than 15 acres of cotton and 5 or more dairy cows, —$70 and $456 with 15 acres or more of cotton and less than 5 dairy cows, and $201 and $876 with 15 acres or more of cotton and 5 or more dairy cows.

**American-Egyptian cotton utilization, supplies, and prices**, E. H. Pressley, R. Whitaker, and G. W. Barr (*Arizona Sta. Bul. 167* (*1940*), *pp. 39–77, figs. 3*).—The qualities characterizing American-Egyptian cotton, its utilization by mills of the United States, and the competition between it and Egyptian cotton, sea island cotton, longer staples of American upland cotton, and rayon are described and discussed. Data are included and discussed as to acreages, production, yields per acre, and carry-over of American-Egyptian cotton, and as to the relations between the prices for it and imported Egyptian cotton.

"In staple length American-Egyptian cotton fully meets the needs of domestic spinners in that it averages as long or longer than its principal competitor,

imported Egyptian cotton. In grade certainly the unusually high grade crops of recent seasons, with the exception of the first picking of the 1939–40 crop which was damaged by rain, have been fully up to any reasonable expectation of domestic spinners. In character Pima cotton has acquired a certain amount of ill will in the domestic textile industry in comparison with imported Egyptian cotton. There is apparently some justification for the complaints of spinners, especially those manufacturing thread yarns, regarding the character of Pima cotton. The presence of upland fibers or fibers from hybrids between American-Egyptian and upland cotton often found in American-Egyptian bales may account for some of the complaints by spinners. . . . SxP, a comparatively new variety of American-Egyptian cotton, seems to compare favorably in character with imported Egyptian varieties and has been found satisfactory by thread yarn spinners. In this respect SxP seems to be superior to Pima, but the extra-staple length of Pima cotton is preferred by certain manufacturers of fine yarns. . . . Egyptian cotton with possibly a few exceptions could easily displace all of the American-Egyptian cotton used in this country and probably would do so if prices of American-Egyptian were maintained permanently at substantially higher levels than those for competitive Egyptian varieties."

During the eight seasons ended 1937–38, supplies of American-Egyptian cotton averaged 24,300 running bales, exceeding the average disappearence by nearly 9,900 bales, and except for one season was adequate to meet mill requirements. Yields of American-Egyptian cotton during the 5-yr. period ended with 1939 averaged about 250 lb. per acre compared with about 510 lbs. for upland cotton grown in Arizona. During recent years the prices for Pima cotton at Phoenix have averaged about 2.1 times those for upland cotton. During the 8 yr. ended 1937–38 the price of Pima No. 2 cotton at New England mill points averaged 24.4 ct. per pound as compared with 24.8 ct. for imported Egyptian cotton.

**Financial results of the operation of large sugar cane farms in Louisiana, 1937 and 1938,** R. A. BALLINGER (*Louisiana Sta. Bul. 315 (1940), pp. 23*).—This study is based on reports from 33 farms in 1937 and 35 farms in 1938 in the Mississippi, the Lafourche, and the Teche regions. An analysis is made for all the farms and the farms in each region of the costs and returns, and the relation of number of acres cultivated and acres in cane, tons of cane sold per farm, and yields per acre to costs and returns.

The average acreage of cane per farm was 1,447.76 acres in 1937 and 1,305 acres in 1938. The average total income per ton of cane and per acre of cane were $4 and $84.13 in 1937 and $3.73 and $86.74 in 1938. The operating expenses were $3.85 and $81.08 in 1937 and $3.59 and $83.56 in 1938, and the net income after allowance for interest —27 ct. and —$5.76 and —25 ct. and —$5.77.

"In both years there were wide variations in the costs and the net incomes of the farm operators. An analysis of the data secured reveals several factors which appear to be related in a significant manner to the financial results obtained. Each year the total costs per ton of cane sold were higher in the Lafourche region than in either of the other regions and the average net loss was greater. These differences appear to be associated with the fact that the average size of the farms studied was larger and the percent of the total area in the farms which was cultivated was smaller in the Lafourche region than in the other regions. There was a tendency for the costs per ton of cane sold to be higher on the larger farms than they were on the smaller ones. Also, the net incomes per ton were lower. This was true in both years. It was also true regardless of whether the size of farms was measured by the number of acres of land in cultivation, the number of acres in cane, or the number of tons of cane sold. . . .

"One of the most important factors influencing costs on sugarcane farms in Louisiana is the yield per acre of cane. This is shown both by the lower costs per ton in 1938 as compared with 1937, and by the fact that in both years costs were lower on the farms with high yields than they were on the farms with low yields. In both 1937 and 1938 lower costs were associated with higher net incomes."

**Financial results of the operation of sugar mills in Louisiana, 1937 and 1938**, R. A. Ballinger (*Louisiana Sta. Bul. 316* (*1940*), *pp. 23*).—Data were collected relative to the operation of 30 mills in 1937 and 32 mills in 1938 in the Mississippi and Teche regions. Tables show the average costs, income, etc., per mill, per ton of cane and 100 lb. of sugar for all mills, and per 100 lb. of sugar for mills in the two regions. An analysis is made of the relations of size of mill, volume of cane ground, and yield of sugar to costs and returns, and of number of days of capacity grinding to costs, income, and volume of business.

"Each year there were wide variations in the costs of operating various mills and in the income which the mills received. Various factors appear to be related to these variations in ways which seem to be more or less significant. The total cost of operation per 100 lb. of sugar manufactured was lower for mills in the Teche region than it was for mills in the Mississippi region in both 1937 and 1938. Correspondingly, net operating income was higher. Apparently, the higher yield of sugar per ton of cane obtained by the mills in the Teche region is one of the important factors responsible for this result. In general, the larger sugar mills operated at somewhat lower costs and higher net incomes per 100 lb. of raw sugar manufactured than did the smaller mills. These results were accompanied by the securing of higher yields of sugar and by the recovery in the sugar manufactured of a larger percentage of the sucrose in the cane ground by the larger mills. Also, the larger mills of course ground more cane than the smaller mills. Especially in 1938 these larger volumes of cane resulted in more days of capacity grinding for the larger than for the smaller mills. Each of these factors apparently made some contribution to lower costs and higher net incomes."

[**Truck farming in Copiah County, 1938–39**], M. Guin (*Miss. Farm Res.* [*Mississippi Sta.*], *3* (*1940*), *No. 3*, *p. 1*).—Brief findings are included as to farm receipts, expenses, prices, labor income, etc., on 80 typical truck farms.

**Economic considerations in growing canning factory tomatoes in northwestern Indiana**, M. G. Smith and L. Robertson (*Indiana Sta. Bul. 442* (*1939*), *pp. 24*, *figs. 12*).—Records from 34 to 53 farms per year, total 207, were obtained on the costs and practices of producing tomatoes in Lake and Porter Counties in 1934 to 1938, inclusive. An analysis is made by years of growing, harvesting, and marketing costs; receipts; labor returns, etc., per acre and ton; and of the factors affecting profits.

Returns per hour for all man labor varied from −27 ct. in 1934 to 70 ct. in 1937, average 23 ct. The average per acre for these 2 yr. and for the 5-yr. period, respectively, were costs of growing, harvesting, and marketing $33.93, $76.37, and $52.18; net returns −$23.70, $54.48, and $8.26; and yields 0.61, 7.64, and 3.62 tons. Growing costs did not vary greatly with yield. Harvesting and marketing costs varied directly with yields. Light-colored upland soils produced only two-thirds as high yields as the darker upland soils, and the net returns were slightly higher on the dark soils. Highest yields were usually obtained when legume hay or pasture crops preceded tomatoes. Less man labor and more fertilizer and manure were used on the larger farms, and the growing costs were less and labor returns higher on larger fields. Early-maturing varieties gave the best results. Growers spending large (average $6.05) and medium

(average \$4.18) amounts per acre for fertilizers had higher profits and labor returns than those spending less than medium amounts (average \$2.02). Tomatoes set out from the first to the middle of May made the higher net returns. Machine setting required less man labor and was more economical than hand setting on larger acreages. Setting at average or medium distances between rows and in rows gave the highest returns. At least four cultivations and a medium hoeing gave the highest returns. High yields, use of large amounts of fertilizers and manure, and high quality of land were associated with high percentages of U. S. No. 1 tomatoes. An average of 86 hr. of man labor per acre was required for growing, harvesting, and marketing.

**An economic study of the broiler industry in western Indiana,** E. C. YOUNG (*Indiana Sta. Bul. 441 (1939), pp. 32, figs. 16*).—Records consisting of inventories, cash receipts and expenses, farm feed, labor and supplies, and of practices in production and marketing were obtained from 43 producers for 70 lots of broilers in 1936 and from 48 producers for 71 lots in 1937 in Benton, Warren, Tippecanoe, Fountain, and Carroll Counties.

The average cost of production was 18.3 ct. per pound in 1936 and 20.1 ct. in 1937. The average profits per pound were 5.2 and 2.9 ct., respectively. Of the total costs feed constituted 54.3 percent, chicks 19.8, fuel 8.3, and labor 7.8 percent. Variations in cost of production and prices received were of approximately equal importance in their effect on profits. Under average management 4.2 lb. of feed per pound of broiler was required to produce broilers to weights of from 2.5 to 3 lb. Death losses increased as number of chicks started per pen increased. Kind of fuel was related to rate of gain, feeding efficiency, and death loss. There was little difference in results with straw and peat litter. The greatest profit was with broilers finished to from 2.5 to 3 lb. and sold in May. Size of the enterprise had little relation to cost of production per pound. The highest average price for broilers was obtained in April and that for springers in May.

"Demand, as measured by factory pay rolls in the United States, trend, and the Indiana farm price of chickens in the previous period explain most of the variation in chicken prices from year to year. It was possible to forecast the spring price of chickens in January each year with the use of January 1 factory pay rolls, trend, and the January farm price of chickens."

**Foreign Agriculture, March–April 1940]** (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr., 4 (1940), Nos. 3, pp. 131–177, figs. 14; 4, pp. 179–272, figs. 14*).—Included are articles in No. 3 on The Russian Peasant Household Under the Mir and the Collective Farm System, by L. Volin (pp. 133–146), and Finland's Agriculture, by P. G. Minneman (pp. 147–174), and a brief summary of the decrees issued by the French Government on February 29, 1940, to further control the economic life of that country; and in No. 4 on Wartime Agricultural and Food Control in Germany, by H. L. Franklin (pp. 181–220), and Turkish Agriculture—Changing Agro-Economic Policy, by N. W. Hazen (pp. 221–272).

**Transportation of agricultural products in the United States 1920–June 1939, I–III,** E. M. COLVIN (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 81 (1939), pts. 1, pp. X+250; 2, pp. VIII+251–565; 3, pp.* [2]+*566–812*).—This is a selected list of references relating to the various phases of railway, motor, and water carrier transportation.

Part 1, General Transportation and Transportation of Agricultural Products, contains references "relating to the transportation of agricultural commodities, and in addition references relating to transportation in general and to certain of its phases—competition between carriers, coordination of transport facilities, containers, freight rates, and State and Federal regulation of transport facilities.

The references relating to agricultural commodities are classified according to commodity."

Part 2, Highway, Rail, and Water Transportation, contains references "relating to three kinds of transportation—highway, railway, and waterway. Under the general sections of each have been included selected references to some of the more important books and periodical articles on these subjects. The section on highway transportation includes material relating to motor truck transportation and also to the highways themselves. References may be found relating to financial policies, Government promotion and financing, safety, adequacy and economy of service, State and Federal regulation, taxation, terminals, and trucking rates. Only a relatively small portion of the general material relating to highways has been included. The section covering railway transportation includes, in addition to references relating to railway transportation in general, material on consolidation of railways, financial policies of the roads, freight rates, Government promotion and financing (including the pros and cons of Government ownership, land grants, and subsidies), safety, adequacy and economy of service (including general references, references on container cars, electrification, express, loss and damage in transit, parcel post shipping, and refrigerator cars), taxation, terminals, and volume, density, and character of traffic. Under water transportation may be found general references, references relating to coastal waterways, inland waterways (including the Mississippi River, the New York State Barge Canal, and the St. Lawrence Waterway), ocean transportation with references on the American merchant marine, ocean freight rates, the Panama Canal, State and Federal regulation, and terminals."

References to passenger traffic, labor problems of carriers, problems of maintenance, construction and equipment (with a few exceptions), regulations and laws of carriers (except more general references), and air transportation have not been included. Law journals as a class were not searched, but a number of articles are included. A list of trade journals and periodicals dealing with transportation is appended.

Part 3, Index to Parts I and II, is a detailed author and subject index.

**The use of farm trucks in marketing farm products in central Indiana,** T. K. Cowden (*Indiana Sta. Bul. 443 (1939), pp. 37, figs. 9*).—Records applying primarily to 1937 were obtained from 261 farmers in central Indiana, of whom 166 owned trucks, 58 owned trailers, and 37 had neither trucks nor trailers. Data as to cost of operating 148 farm automobiles were also obtained from the same farmers. Some of the findings were as follows:

The average amount of operating expenditures for all trucks included in the study was $199.37 or 4.9 ct. per mile. The cost per mile for farm trucks driven approximately 8,700 miles per year was only about half as great as that for trucks driven 2,000 miles or less. The average farmer used his truck about 197 days during the year. About 28 percent of the miles traveled and 55 percent of the hours of use were on the farm. About 26 percent of the mileage was for custom hauling. The truck owners generally saved money by hauling their products to market, but 27 percent could have hired all their products transported more cheaply. The most important factors affecting profitableness of farmers hauling their own products were cost of hiring the service, size of load hauled, and cost of operating the truck. The chief factor responsible for losses was hauling small loads. Return loads were hauled on less than 2 percent of the farm truck trips. Forty-five percent of the farm truck owners did some hauling for other persons, the average annual receipts being $227. Eighteen percent of the farmers doing custom hauling lost money on such hauling. After deducting cost

of hiring transportation service performed by farm trucks and receipts from custom hauling from total truck operation costs, the average amount remaining to be charged to use on the farm averaged $50 per truck. The lowest transportation cost was obtained by owners of 1½-ton trucks who did some custom hauling.

The automobiles were driven on an average of 7,100 miles annually at an average cost of 3.2 ct. per mile. About one-half of the mileage was on farm business. Approximately 40 percent of the trips with trailers were made at a loss.

**The marketing of farm woodland products in Carroll County, New Hampshire,** A. MacLeod and J. Chandler (*New Hampshire Sta. Bul. 318 (1939), pp. 31, figs. 11*).—The woodland and agriculture of and market outlets for timber from the area are briefly described. Data are included and discussed as to acreages, quantity, and quality of merchantable timber in the area, production on sustained yield basis, consumption of, prices paid for, costs of transporting forest products from the area, and the relation of production to market outlets. Cooperative opportunities in the area, income possibilities for the woodland area, and optimum organization of plants are discussed and a suggested program for the area outlined. Some of the findings were as follows:

The woodland acreage of the area studied is 223,000 acres, of which approximately 52,000 acres supports merchantable timber. The total stand of merchantable timber is approximately 260,000,000 bd. ft. The present market outlets take about 6,000,000 bd. ft. per year. The annual cut during the next few years on a sustained yield basis would be about 5,000,000 bd. ft. Plant capacities bear little relation to amounts of timber cut by particular industries, but in general effective capacities are in excess of annual consumption. Stumpage prices have ranged from $1.50 to $5 per $1,000 bd. ft., depending on the type of timber, grade, and accessibility. Log prices during the period from 1924 to 1939 have ranged from $18 per 1,000 bd. ft. in 1924 to $20 in 1927 and $10 in 1937 and other years. Transportation charges tend to vary with distance rather than with value of product. The farm income for sales of woodland products was about $30,000 in 1929, and could be increased by more efficient assembling operations and the adoption of improved production practices. Cooperation offers opportunities for increased income from marketing forest products from the area.

**Shipments of dairy products into Knoxville, Tenn.,** C. E. Allred, B. H. Luebke, and W. S. Crawford (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 103 (1940), pp. IV+20, figs. 16*).—The area covered in this study is that for which Knoxville is the principal wholesale distributor of dairy products, and it comprises approximately 18 counties in eastern Tennessee, 4 in Kentucky, 3 in Virginia, and 1 in North Carolina. Dairy production in the area, the amounts of different dairy products shipped into Knoxville in 1938, the origin of different products by States and by distributors, the trade areas of different Knoxville wholesale distributors, and the shipments of dairy products out of the area are described.

The total purchases of dairy products by Knoxville wholesalers in 1938 were approximately 41,000,000 lb. in terms of whole milk equivalents, of which 57.5 percent was shipped in from States other than Tennessee. Two-thirds of the powdered milk, 70.6 percent of the butter, 64.1 percent of the condensed milk, 53.7 percent of the cheese, and 34.7 percent of the evaporated milk purchased in the area was shipped in from other States. In some years considerable cream, butter, and evaporated milk are shipped out of the area.

**Ten years of farm sales of milk in four Ohio markets,** R. W. Sherman and C. G. McBride (*Ohio Sta. Bul. 609 (1939), pp. [1]+38, figs. 9*).—This study is based on records of individual sales of shippers of the Canton, Cincinnati, Columbus, and Dayton markets obtained from milk distributors and coopera-

tive milk marketing associations. The records for the Canton and Cincinnati markets cover the years 1925–36, those for Dayton 1926–36, and those for Columbus 1927–36. The total number of records for the different years vary from 816 to 2,533. The analysis follows in general the same lines as those in the previous study of the same groups (E. S. R., 67, p. 83). The first section of the report deals with butterfat content of the milk delivered and discusses its importance in market milk and the average content and seasonal variations in the milk delivered, and compares the content in deliveries by winter and summer dairies and those from regular and irregular shippers. The second section deals with average daily, monthly, and yearly volume of sales for each market, the monthly variations, the shipments by summer and winter and regular and irregular shippers, etc. The third section is a similar but more detailed analysis of the records of 374 producers in the four markets that made continuous shipments during the entire period of the study.

Of the 394 shippers in the Cincinnati market included in 1931, only 225 were shipping through the same distributing outlet in 1936, and of the 400 shippers in the Columbus market in 1927–29, only 203 were shipping to the same distributors in 1936. The 2 factors—market standard for fat content, on which the price paid for milk is based, and the butterfat differential—are probably more influential than all the other marketing factors influencing shippers to attempt to change the butterfat content of milk delivered. In all 4 markets the average butterfat content had increased, and during the later years of the study was well above the market standards for the markets. Deliveries by summer shippers had a higher butterfat content than those of winter shippers. Less seasonal variation in butterfat content apparently follows less seasonal variation in deliveries. Deliveries by producers of small quantities of milk had a higher butterfat content than those by shippers of large quantities. Large volume milk sales showed much less seasonal variation than small volume sales. Winter shippers for the 4 markets combined delivered on an average 14.4 percent more milk per shipper than summer shippers.

"During the period before 1930, only Columbus, of the 4 markets studied, had used a base and surplus buying plan. During that period the Columbus sample had less seasonal variation than any of the other 3 markets. Since 1930 the other 3 markets have adopted some type of base and surplus plan, and all have decreased their seasonal variation of sales. The Columbus shippers improved about the same amount as the other 3, and are still much less variable in sales than the shippers of the other 3 markets. . . . The sales of milk of those shippers who had sold through the same outlet for at least 10 yr. without interruption were higher than those for the total samples. These shippers were no different from the others in seasonal variation of milk deliveries. The records of milk deliveries of these continuous shippers indicate that the base and surplus plan of selling has a tendency to bring about a slight reduction of total sales as well as to decrease the month to month variation."

**Missouri farm prices since 1910**, H. M. Haag (*Missouri Sta. Res. Bul. 312 (1940), pp. 47, figs. 8*).—A new series of index numbers of Missouri farm prices is constructed. "The index is that which is commonly described by statisticians as a 'weighted arithmetic average of relatives' index." The base period is July 1924 to June 1929. "This new series includes 25 different farm products which accounted for 93.7 percent of the cash farm income received by Missouri farmers during the 10 yr., 1924–33. The old index [E. S. R., 55, p. 589] included only 14 commodities which were responsible for 77 percent of Missouri's farm income." In the computation of the new series, index numbers were calculated for each of the 8 groups of products—meat animals, poultry products, dairy

products, work animals, grains, cotton, hay and seeds, and other crops, and for the three species of meat animals included in the complete index. The method used in the construction of the index numbers in the allocation of income from groups of products and in calculating the index of seasonal variation for adjusting the prices for various products are described. Tables show by years 1910–39 for each group of products, for all groups combined, and for hogs, cattle, and sheep the monthly indexes and annual averages of prices, and the monthly prices of different products included in the indexes.

**North Dakota farm prices for February '40,** W. L. Ettesvold (*North Dakota Sta. Bimo. Bul., 2 (1940), No. 4, p. 20*).—Tables include the average prices and indexes of such prices for 14 agricultural commodities, the North Dakota and the United States farm price indexes, the United States index of prices paid by farmers, and the North Dakota ratio of prices received to prices paid. Comparisons are made with January 1940, February 1939, and the average 1910–14.

**Deciduous fruit statistics as of January, 1940,** S. W. Shear (*California Sta. Mimeog. Rpt. 69 (1940), pp. [1]+87*).—This publication includes the same fruits and follows the same form as that previously noted (E. S. R., 81, p. 132). The tables include annual data, mostly for the past 15 or 20 yr., as to acreage, production, yield, utilization, consumption, shipments, exports, imports, and prices, with special reference to California and the United States for apples, apricots, cherries, dates, figs, grapes, peaches, pears, plums, and prunes. Statistics on wine and brandy production and consumption have been added.

**Crops and Markets, [February–March 1940]** (*U. S. Dept. Agr., Crops and Markets, 17 (1940), Nos. 2, pp. 25–52, figs. 6; 3, pp. 53–72, fig. 1*).—Both numbers include crop, livestock, and market reports of the usual types.

## RURAL SOCIOLOGY

**How much for family living?** J. P. Greenlaw (*North Dakota Sta. Bimo. Bul., 2 (1940), No. 4, pp. 11–14, figs. 3*).—"This study reports the amounts and sources of income and the distribution of expenditures as revealed by an analysis of the farm family record books of 118 North Dakota borrowers from the Farm Security Administration in 1938 and early 1939. The proportion of the farm income used for family expenses is considered with respect to its detailed distribution, the factors influencing it, its adequacy in maintaining a 'low cost good diet,' and other requirements for health and efficiency. The need for an increase in net farm income in order to insure permanent rehabilitation is emphasized."

## AGRICULTURAL AND HOME ECONOMICS EDUCATION

**Directory of organization and field activities of the Department of Agriculture, 1939,** E. Stephens (*U. S. Dept. Agr., Misc. Pub. 376 (1940), pp. IV+204*).—This directory supersedes Miscellaneous Publication 304 (E. S. R., 79, p. 272) and includes an index of the names of all listed. The first part (pp. 1–115) lists the organization structure of the bureaus and offices of the Department, exclusive of the Farm Credit Administration. The lists of personnel for the different units are quite complete for the workers engaged in research, but only supervisory personnel at each location is included for the other activities. The second part (pp. 116–178) lists by cities and towns the location of field activities of the Department in the States, Territories, possessions, and foreign countries. The work at each location is shown by bureaus and offices and its nature briefly indicated.

**Proceedings of the Association of Land-Grant Colleges and Universities** (*Assoc. Land-Grant Cols. and Univs. Proc., 53 (1939), pp. [1]+V+341*).—This report of the meeting held in Washington, D. C., November 15–17, 1939 (E. S. R., 82, pp. 1, 144, 145), includes abstracts (in some cases complete papers) of the papers and discussions presented at the general sessions, the joint sessions of the section on agriculture, the subsections on resident teaching, experiment station work, and extension work, and the sections on engineering, home economics, and graduate work; the minutes of the executive body, including the reports of committees; and lists of the officers and committees for 1940. Memorials for R. A. Pearson, J. G. Lipman, J. H. Shepperd, and J. C. Futrall are included.

## FOODS—HUMAN NUTRITION

**[Studies in foods and nutrition of the Washington Station]** (*Washington Sta. Bul. 384 (1939), pp. 40–43*).—Included in this progress report (E. S. R., 81, p. 301) are summaries of studies, some of which represent an extension of earlier work, by E. N. Todhunter and R. C. Robbins, on varietal differences in vitamin C (ascorbic acid) content of frozen red raspberries, factors affecting the vitamin C content of frozen-pack peas, the vitamin C content of D'Anjou pears, and the vitamin C requirement of college women; and by M. M. Boggs on factors influencing the quality of peas preserved by the frozen-pack process (partly coop. U. S. D. A. and West. Wash. Expt. Sta.).

**Flavor in foods,** B. M. Watts (*Jour. Home Econ., 31 (1939), No. 10, pp. 673–679*).—This address gives a general survey covering the relation of taste and smell to flavors in foods and the factors affecting flavor in bread, dairy products, and meat. Progress in the prevention of rancidity is also discussed. Twenty-nine references, mostly to recent literature, are cited.

**Preparing and baking yellow sponge cake at different altitudes,** W. E. Pyke and G. Johnson (*Colorado Sta. Tech. Bul. 27 (1940), pp. 22, figs. 10*).—This bulletin continues a series of publications on cake baking at high altitudes (E. S. R., 75, p. 278) by presenting certain results obtained in the study of yellow sponge cake. In contrast with the earlier work on angel food cake in which the adjusted formulas for high altitudes contained very little sugar, an effort was made in the present study to retain the sugar and at the same time produce cakes of comparable volume, texture, and eating quality at various altitudes. This was achieved largely through new methods of mixing, with alterations only in the quantity of flour and liquid.

When the conventional method of mixing sponge cake was tested to learn the tolerance of the meringue and batter for what is termed mechanical abuse, it was found that although the batter was very unstable the meringue, as tested by methods similar to that described by Barmore (E. S. R., 72, p. 275), was very stable. As a result of testing various methods of mixing the meringue with the other ingredients, two variations (cold and hot methods) of a single meringue method of mixing were developed, as well as modifications in the conventional method.

Data upon which these methods are based are presented and discussed, and tables are given for both whole egg and egg yolk sponge cakes, with the quantities of ingredients for various altitudes in terms of metric (grams), commercial (pounds and ounces), and housewives (volume measure) units.

It is noted that the yolk sponge cakes, although containing no leavening agent but air, are of exceedingly high quality and very tender, and that the formulas given will yield the most desirable sponge cake at low as well as high altitudes.

**Simulation, by chemical agents, of cooking of potato tissue,** C. J. PERSONIUS and P. F. SHARP. (Cornell Univ.). (*Food Res., 4 (1939), No. 5, pp. 469–473, figs. 2*).—In this continuation of the series of studies on potato tuber tissues (E. S. R., 81, p. 864), changes in potato slices similar to those produced by cooking were produced by treating the potato slices first with chemicals producing cold gelatinization of the starch and then by oxalates, which had been shown in the previous paper of the series to be capable of weakening the intercellular cementing material of the tissues by removing calcium from the calcium pectate. The reagents which produced cold gelatinization of the potato tissue included 40 percent solutions of chloral hydrate or of formaldehyde at room temperature, a 2 N solution of sodium salicylate at room temperature, and a solution containing 40 gm. of ammonium thiocyanate in 200 cc. of water and 50 cc. of 95 percent alcohol at 40°–50° C. The reaction was most rapid with the ammonium thiocyanate solution (20–40 hr.). Chloral hydrate and sodium salicylate required 48 hr. and formaldehyde 5–6 days.

The texture of the potato tissue subjected to the two reactions resembled that of cooked potatoes. Potatoes which were mealy or soggy after cooking also appeared mealy or soggy after the chemical treatment. It is concluded that neither the gelatinization of the starch nor the decrease in cell adhesion of the tissue offers a satisfactory explanation of differences between mealy and soggy potatoes.

**Blackberries do not contain tartaric acid,** J. R. EOFF, JR., and W. J. McVEIGH (*Fruit Prod. Jour. and Amer. Vinegar Indus., 19 (1939), No. 4, pp. 104, 111*).—Eleven samples of blackberries, including wild and cultivated fruit and one canned product of berries packed in their own juice, were found to contain no tartaric acid or tartrates. The determinations were carried out by the method of Kling (E. S. R., 23, p. 418), which was found to give satisfactory results in recovery experiments. From 2 to 3 parts per 100,000 is given as the apparent limit of this method.

**Standardizing methods of broiling beef steaks and methods of cooking pork chops,** J. A. CLINE and H. McLACHLAN (*Missouri Sta. Bul. 413 (1940), pp. 73, 74*).—In this progress report on meats (E. S. R., 78, p. 274) comparisons are summarized of palatability, cooking losses, and time required for broiling various cuts of beefsteaks (2 in.) at 175° and 225° C. to an internal temperature of 58°, and for cooking 1-in. rib and loin pork chops by braising with water and without water and broiling at constant temperatures of 150° and 175° to an internal temperature of 84°.

**Nutritive properties of certain animal and vegetable fats,** R. HOAGLAND and G. G. SNIDER (*U. S. Dept. Agr., Tech. Bul. 725 (1940), pp. 12*).—Refined lard, hydrogenated lard, leaf lard, neutral lard, oleo oil, cottonseed oil, hydrogenated cottonseed oil, and peanut oil were compared with regard to their relative nutritive value as determined by growth and digestion experiments with young male albino rats. Digestive coefficients and growth-promoting values per 100 calories of fat consumed are given for each of the dietary levels of fat employed. These levels, representing 5, 30, and 55 percent by weight of the diet, corresponded, respectively, to 12, 53, and 78 percent of the total dietary energy value.

The growth-promoting values of the fats did not show consistent relationship to their respective digestive coefficients. No consistent relationship was found between the chemical composition of a fat or its melting point and the nutritive value of the fat. In a few cases linoleic acid appeared to be a limiting factor. As judged by the iodine numbers of the undigested fat acids, it appeared that there was a pronounced selective absorption of the unsaturated fat acids. The iodine numbers of the metabolic fat acids indicated that the unsaturated fat acids are a normal excretory product of the albino rat.

**Milk as a food throughout life,** M. H. Irwin (*Wisconsin Sta. Bul. 447* (*1939*), *pp. 40, figs. 12*).—Written and illustrated in popular style, it is the aim of this bulletin to acquaint the layman with the fact that milk is a food, not merely a beverage, and that it should have an important place in the diet at all ages. The nutritional values and shortcomings of milk are considered in the discussion of its mineral and vitamin constituents and its protein, fat, and carbohydrate content. Pasteurized, evaporated, condensed, dried, filled, soft-curd, homogenized, and vitamin D milks are discussed briefly, with special reference to the effect on nutritive value of the processes involved in the preparation of the products. The nutritive values of butter, cheese, and ice cream are also considered briefly.

**The value of carbonated beverages in the diet,** W. V. Cruess. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, *19* (*1939*), *No. 4*, *pp. 100–103, 106, 121*).—An address.

**A study of the diets of one hundred college women students,** S. O. Morris and M. Bowers. (Utah State Col.). (*Jour. Amer. Dietet. Assoc.*, *15* (*1939*), *No. 5*, *pp. 338–362*).—From 500 weekly records of food consumption in terms of ordinary household measures, kept by college students in beginning courses in nutrition, 100 were selected for comparison with accepted standards of nutrition and grouped according to manner of living—at home, boarding, in bachelor quarters, and in dormitories. In comparison with the requirement standards of Rose and Sherman and Daniel and Munsell, the groups as a whole had a lower mean energy intake, lower phosphorus, iron, vitamin $B_1$, and ascorbic acid intakes, and slightly higher intakes of protein, calcium, and vitamin A. In relative ranking, the dormitory group was first in everything but protein, vitamin $B_1$, and ascorbic acid, ranking second for these items. The group living at home was lowest in everything except vitamin A (second place) and vitamins $B_1$ and C (third place). The boarding group ranked highest in protein and lowest in vitamin $B_1$ and C and the group living in bachelor quarters highest in $B_1$ and C and lowest in vitamin A. In the frequency with which different types of foods appeared in the records, the home group ranked highest and the bachelor quarters group lowest in milk consumption, the dormitory group highest and the boarding group lowest in all vegetables and in cooked vegetables, the bachelor group highest and the dormitory group lowest in raw vegetables, the home group highest and the dormitory group lowest in whole grain cereals, and the dormitory group highest (followed closely by the boarding group), with the bachelor group lowest in meat, eggs, and cheese. The consumption of candy bars was highest among the girls living at home and lowest among the girls boarding.

**The relation between change in basal metabolism and growth during adolescence,** C. B. Davenport, O. Renfroe, and W. D. Hallock (*Child Devlpmt.*, *10* (*1939*), *No. 3*, *pp. 181–202*, *figs. 8*).—The study was undertaken to determine whether or not the basal metabolic processes concerned in maintenance of the body can be differentiated from those concerned in growth. Basal metabolism tests with the Sanborn Graphic apparatus were made yearly over a period of from 5 to 8 yr. on some 55 boys and 55 girls from 8 to 13 (mostly 10–12) yr. of age at the beginning of the experiment. Weight and height measurements were made after each metabolism test. The relationship between stature, weight, and basal metabolism for each subject was computed by the method of mass correlations, using both a mass standard and the individual's own base line, with results which are summarized as follows:

"Mass correlations were mostly low, not over +0.36. Intra-individual correlations vary from −1.00 to +1.00. The averages of such intra-individual correlations are a little higher between B. M. [basal metabolism] and body weight

than between B. M. and stature. The correlation between excess of body build and of $O_2$ consumption is high, 0.483, for girls, but not for boys. The highest correlation obtained (0.67) is between B. M. in girls whose weight change amounts to ±2.5 kg. per year deviation from expected gains. Thus during the adolescent spurt the increased B. M. processes associated with increasing weight may amount to 10 percent or more of the basal metabolism as determined before and after this spurt."

**The effect of protein and exercise at different ages on the total energy metabolism,** A. Black and J. R. Murlin (*Jour. Nutr., 17 (1939), No. 4, pp. 347–359, figs. 3*).—This investigation involved comparisons of milk powder and dried whole egg as the source of protein at 8 and 20 percent levels on the total metabolism of rats at varying ages from weaning to 8½ mo., with a further comparison at the high-protein level of the metabolism of the nonexercised and exercised animals. The two proteins were chosen because of previous studies by Sumner and Murlin (E. S. R., 81, p. 305) on their digestibility and biological values in both rat and man. The paired feeding method adapted to three animals was followed, with the animals in each matched triplet receiving low protein, high protein, and high protein plus exercise, respectively. Half of the group received the egg and half the dried milk rations.

Growth records of the 12 rats from each of the 6 groups kept for the entire experiment showed gains on the milk rations of 168, 199, and 176 gm. for the 8 percent protein, 20 percent protein, and 20 percent protein plus exercise, with corresponding gains on the egg ration of 207, 229, and 195 gm. The heat production of all of the groups, expressed on a surface area basis, decreased with increasing age for about 5–6 mo. and then unexpectedly increased again, the increase occurring earlier in the two high-protein groups on the egg ration than in any other group, but in all cases continuing to the end of the experiment.

The low-protein groups on both the egg and milk rations had a higher heat production at the beginning, lasting to beyond 4 mo. on the milk ration, than the high-protein groups. There was less variation in heat production between the two exercised groups than between any other two groups. The average heat production of an equal number of periods equally distributed for the entire experiment was essentially the same for the three groups on the milk ration, but the exercised group on the egg ration had the highest total energy values. On the basis of average heat production values, the level of protein did not influence the heat production. The source of protein had a slight but not statistically significant effect on heat production, with lower values for egg than milk.

**The effect of protein and exercise at different ages on the basal metabolism,** A. Black (*Jour. Nutr., 17 (1939), No. 4, pp. 361–370*).—During the seventh and eighth months of the investigation noted above, basal metabolism determinations were made on a representative number of animals in each group. In addition, similar determinations were made at Cornell University on very old rats (700 days) from the studies of McCay, Maynard, et al. (E. S. R., 81, p. 689).

In the younger animals the average basal metabolism was lowest for the low-protein group, somewhat higher for the high-protein groups, and highest for the high-protein group which had been exercised. The difference between any two groups was small except in the case of the low-protein group and the high-protein group receiving exercise, where the difference was quite significant.

With the old rats a high-protein intake was associated with a higher basal metabolism. The difference in average values of 38.8 calories per square meter of body surface per hour for 15 rats on the high- and of 35.5 calories for 12

rats on the low-protein diet is considered to be significant. A comparison of average basal metabolism data for 11 young rats with that for 11 old rats, carefully matched as to weight, gave values of 814 and 924 calories per square meter of body surface per 24 hr.

**Rural dietaries in Europe,** [E. J. McDougall] (*League Nations Health Organ. Bul., 8 (1939), No. 3, pp. 470-497*).—This article is based on documentary material collected by the Secretariat of the League, particularly the 1938 survey of national nutrition policies (E. S. R., 81, p. 593), supplemented by information gained by the author during the survey noted below.

**Report on bread in several European countries,** [E. J. McDougall] (*League Nations Health Organ. Bul., 8 (1939), No. 3, pp. 498-550*).—Following a general discussion of trends in cereal consumption in Europe since 1918 and of the nutritive significance of bread in the dietary of different countries, information based chiefly on personal visits to the countries in question is presented on the extent of consumption and composition of bread in Belgium, France, Great Britain, Netherlands, Portugal, Spain, Switzerland, Denmark, Norway, Estonia, Finland, Sweden, Latvia, Bulgaria, Greece, Hungary, Lithuania, Poland, Rumania, and Yugoslavia.

**Factors influencing storage of protein with low-calorie diets,** M. E. Lovell and I. M. Rabinowitch (*Jour. Nutr., 18 (1939), No. 4, pp. 339-351, figs. 2*).—A study was made of the nitrogen metabolism of diabetics treated with low calorie diets. The data reported are based on experiences with 8 different diets over a period of 20 yr., a total of 875 nitrogen determinations having been made on 24-hr. samples of urine obtained with diets of different carbohydrate, fat, and protein content. Some of the diets were divided into 3 meals a day, while others were partitioned to include some of the carbohydrate in between-meal feeding. With the high fat-low or moderate carbohydrate-low protein (0.72-0.82 gm. per kilogram of body weight) diets the nitrogen balances were negative; when the diets were changed to the high carbohydrate-low fat type with moderate to liberal protein intake (1.00-1.49 gm. per kilogram of body weight), the nitrogen balances became positive, the change being more pronounced when the carbohydrate allowance was divided to permit the feeding of 10-gm. equivalents between meals and before retiring. In studies with children a pronounced improvement in skeletal growth was obtained by increasing the proportion of protein of animal origin.

These results are interpreted to indicate that carbohydrates tend to enhance, whereas fats tend to interfere with, storage of protein in the body and that time is a factor which influences the protein sparing action of carbohydrates; they indicate further that the storage of protein in the body is also influenced not only by the total amount of protein in the diet but by the amount of protein of high biological value.

**Further studies on relation of fat to utilization of lactose in milk,** E. J. Schantz and C. F. Krewson. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 2, pp. 577-579*).—In this extension of an earlier investigation (E. S. R., 79, p. 562) in which it was shown that certain fats and synthetic triglycerides were effective and others not in preventing loss of galactose in the urine of rats on a mineralized skim milk diet, the effectiveness was tested of several other triglycerides, including those of odd chain fatty acids, and of high levels of glucose. The fatty acids of 12 carbon atoms or more, when fed to the extent of 3-4 percent of the ration, were effective in preventing the loss of galactose and acids, with less than 12 carbon atoms ineffective. The glyceride of a single odd chain fatty acid (pentodecylic) and glucose at levels of 8 and 10 percent did not prevent the loss of galactose. The addition of 2 percent of

$NaCl$ or $Na_2HPO_4$ to the skim milk increased the excretion of galactose by as much as 20 percent. The action of $KCl$ was similar but not as pronounced.

**The minerals of wheat and their relationship to human and animal nutrition,** J. E. Greaves (*Utah Sta. Cir. 113 (1940), pp. 15, figs. 4*).—This circular, based on experimental work conducted by the author over a period of years (E. S. R., 78, p. 189), discusses in general terms the function in nutrition of calcium, magnesium, potassium, phosphorus, sulfur, iron, and copper, and tabulates the variations in the content of these constituents in wheat grown under varying conditions in the State.

**Calcium, phosphorus, and nitrogen balances with pre-school children,** H. L. Yeh and W. H. Adolph (*Chin. Jour. Physiol., 14 (1939), No. 3, pp. 303–314*).—Calcium, phosphorus, and nitrogen balance studies, reported in detail and in summary, were carried out on 11 Chinese children varying from 30 to 54 mo. of age. The 3 children in the first series received a rigidly controlled diet plus supplements at different periods of bone ash at levels furnishing 0.261 and 0.522 gm. of calcium per day, of dried whole milk powder furnishing 0.255 gm. calcium, and of bone meal furnishing 0.262 gm. of calcium. The 8 children in the second series received the institution diet plus bone meal supplements at levels calculated to furnish 0.345, 0.595, 0.845, and 1.071 gm. of calcium per day at the several experimental periods; during the second period powdered whole milk was given in place of the bone meal and at a level furnishing 0.345 gm. of calcium daily.

The base diet was largely vegetarian and essentially cereal, consisting of cereals, soybean milk, vegetables, and fat, with only 5–6 percent of the calories from meat; in the first series of experiments 5–6 percent of calories were also furnished by eggs, which were replaced by soybean products in the second series. The daily protein intake for all the experimental periods averaged 3 gm. per kilogram of body weight, and the nitrogen retentions, which were fairly uniform, averaged 20 mg. per kilogram of body weight. It is pointed out that this retention is low compared with reported retentions of children on a similar nitrogen intake from proteins of animal origin.

The calcium and phosphorus balances showed irregularities, but for the basal diet on an intake of 16 mg. of calcium and 53 mg. of phosphorus per kilogram, positive retentions of 5 and 22 mg. per kilogram, respectively, were obtained. Of the calcium-containing supplements fed in series 1, it appeared that bone meal gave slightly higher calcium retentions than bone ash. On the basis of the calcium balances, bone meal seemed to be equal to milk powder. On raising the calcium intake to a level of 0.46 gm. by the bone meal supplements, a maximum retention of 13 mg. per kilogram of body weight was attained. Successive increments of bone meal up to an intake of 1.4 gm. of calcium per day did not increase the calcium retention. With the bone meal supplements, the calcium: phosphorus ratio of the diet was raised from 0.3:1 to 1.2:1.

**The calcium and phosphorus contents of vegetables cooked in fat,** H. H. Yü and M. L. Fincke. (Oreg. State Col.). (*Jour. Home Econ., 31 (1939), No. 10, pp. 711–713*).—Asparagus and peas were analyzed for calcium and phosphorus and celery (Chinese) cabbage for calcium only, both in the raw and in the cooked state. The cooking method used represented a common Chinese practice and consisted of sautéing the vegetable quickly (6–9 min.) in a small amount of fat. In all cases four carefully matched samples of both raw and cooked vegetable were analyzed by methods noted, and good agreement was obtained between the samples. The raw asparagus averaged 0.026 percent of calcium and 0.074 percent of phosphorus; cooked, the average was 0.026 for calcium and 0.073 for phosphorus. Raw and cooked peas each averaged 0.022 percent of calcium and

0.115 and 0.119 percent of phosphorus, respectively. For celery cabbage values of 0.032 and 0.034 percent were obtained for calcium in the raw and cooked vegetable, respectively. The results obtained show that no cooking losses of calcium or phosphorus were incurred in the quick sautéing of the vegetables studied.

**The availability of the iron in dried peas and beans**, L. Ascham, M. Speirs, and D. Maddox. (Ga. Expt. Sta.). (*Science, 90 (1939), No. 2347, pp. 596, 597*).—The samples, dried at 60°–65° C., broken in a mortar, and ground in a ball mill, were analyzed for total iron by the Farrar method. The availability of the iron was tested by a technic (E. S. R., 81, p. 596) which consisted essentially in measuring in rats rendered anemic (hemoglobin below 3.0 gm. per 100 cc. of blood) by an exclusive milk diet the rise in hemoglobin in response to the addition of the test food. Each food was fed in an amount sufficient to provide 0.2 mg. of iron per day throughout the 6-week experimental period, and 0.05 mg. of copper sulfate was also given daily. Positive controls received similar quantities of copper and of iron furnished as ferric chloride; negative controls were continued on the milk diet. The gains in hemoglobin during the experimental period in response to the various food supplements varied from 8.8 to 10.3 gm. per 100 cc. as compared with a gain of 9.3 gm. per 100 cc. with the ferric chloride supplement. It appears, therefore, that the iron in the dried peas and beans tested is completely available in the nutritionally anemic rat for the regeneration of hemoglobin.

**Iron deficiency anemia in children**, O. D. Abbott and C. F. Ahmann. (Fla. Expt. Sta.). (*Amer. Jour. Diseases Children, 58 (1939), No. 4, pp. 811–816*).—A study was made in Florida of the hemoglobin values of 883 children, including 620 in grades 1–3 of 14 rural grade schools and 263 in nursery schools (ages 3–5 yr.), most of the latter coming from families on relief. Hemoglobin was estimated with the Dare hemoglobinometer (13.77 gm.=100 percent). By the clinical standards used, values as low as 9.64 gm. (70 percent) were considered indicative of anemia and those below 11.70 gm. (85 percent) as subnormal.

The distribution of the children of these two groups, according to hemoglobin levels, is tabulated. Nearly 50 percent of all the children were definitely anemic, while 31 percent had borderline anemia, and there were 5 times as many children in the groups with the lowest hemoglobin values as in those with the highest. Many of the lowest values reached a dangerous level, as low as 25–30 percent. Except in cases in which hookworm infection had produced eosinophilia, the blood picture showed the characteristic reduction of cell size typical of hypochromic anemia.

Two hundred of the grade school children, with hemoglobin values ranging from 35 to 70 percent, and 47 of the nursery school group with values from 40 to 60 percent, were selected for treatment. The first group received 15 gr. (0.97 gm.) of iron and ammonium citrates orally after each meal, while the second group received no iron salts but instead a diet high in iron content. In the former group the hemoglobin regeneration was rapid, hemoglobin values of 75–92 percent being attained after 42 days; in the latter group receiving only food iron, the regeneration was slower, values of only 60–88 percent being attained even after 90 days on the diet. The results, classified by hemoglobin levels (range) are tabulated. During treatment a remarkable improvement in the physical well-being and the mental alertness of the children was noted.

**Iron-resistant anaemia and latent rickets in schoolchildren**, N. Crowley and S. Taylor (*Arch. Disease Childhood, 14 (1939), No. 80, pp. 317–322, figs. 8*).—Among 131 children seen at two nutrition clinics, 12 (from 6 to 12½ yr. of age) were found to have an iron-resistant hypo- or orthochromic anemia associated with a low inorganic blood phosphorus but with no definite clinical signs of

rickets. Of these, 8 were treated with iron alone, vitamin D alone (in the form of two massive doses of 200,000 International Units at 2-week intervals), and a combination of the two. All but 2 of the subjects showed no increase in hemoglobin on the iron alone, and the other 2 showed a slight increase on either iron or vitamin D alone. One child did not respond at all to vitamin D treatment, but in all of the others the blood phosphorus was restored to normal by vitamin D alone and both blood phosphorus and hemoglobin by the iron treatment combined with vitamin D. Excluding the one case failing to respond to vitamin D, the mean hemoglobin value after iron alone and vitamin D alone was 79 percent (Haldane) and after the combined treatment 89 percent. It is thought that in children with a mild iron-resistant hypochromic anemia associated with latent low phosphorus rickets adequate supplies of vitamin D are essential if the iron is to be properly utilized for blood formation.

**Iodine in city waters and vegetables in Texas,** G. S. FRAPS and J. F. FUDGE (Tex. Expt. Sta.). (*Food Res., 4 (1939), No. 4, pp. 355–362*).—A total of 103 samples of water from cities distributed in 10 different areas in Texas were analyzed for iodine content. The mean value was 56 parts per billion, with a standard deviation of 60. A frequency distribution tabulation indicated that the iodine content of waters was highest in those geographical regions covered with relatively heavy soils and located in the subhumid section of the State. The quantity was found to be significantly correlated with total sodium salts and with sodium chloride but not with total calcium salts or calcium carbonate.

The vegetables analyzed were grown on various soil types in 5 different areas and included beans, beets (leaves and roots), broccoli, brussels sprouts, cabbage, carrots, eggplant, endive, mustard, okra, peppers, potatoes, spinach, squash, Swiss chard, tomatoes, and turnips (leaves and roots). Iodine values ranging from 62 to 3,502 parts per billion were obtained, these being high as compared with the assembled values reported for several of the vegetables grown in other States. The content varied with the variety, location, and soil, but in general the leafy vegetables were much higher in this constituent than the root or fruit forms.

**Rate of appearance of ossification centers from birth to the age of five years,** L. W. SONTAG, D. SNELL, and M. ANDERSON (*Amer. Jour. Diseases Children, 58 (1939), No. 5, pp. 949–956, figs. 4*).—A scale for rating progressive skeletal development of boys and girls from birth to the age of 5 yr. is presented. The scale is based on data collected in a study of longitudinal growth of 149 normal children (75 boys and 74 girls) in which all the bones and joints of the left upper and lower extremities were observed roentgenologically as to the time of appearance of 67 ossification centers. The list of centers counted includes ones in the shoulder, elbow, wrist and hand, hip, knee, and ankle and foot, these being chosen as centers entirely cartilaginous at birth but with ossification appearing normally within the first 5 yr. of life. A complete set of roentgenograms was taken at the age of 1, 3, 6, 9, 12, 18, 24, 30, 36, 42, 48, 54, and 60 mo., respectively. Each child was examined on an average of about 7 times, giving a total of 1,022 sets of plates (including from 58 to 106 sets for each of the various age groups) upon which to base the appraisal.

The total number of centers on the left side of the body ossified at given age levels is indicated by table and by graph for boys and girls. Additional curves are given for specific areas. These curves used as the rating scale indicate that the rate of ossification is faster in girls than in boys, and that the greater acceleration in ossification at 12–42 mo. for girls and at 18–48 mo. for boys is attributable to the appearance of centers in the epiphyses of the metacarpal, metatarsal, and phalangeal bones.

The advantages claimed for the method are that it is rapid and objective and requires little skill, and is not subject to the errors inherent in examining the growth of only a hand or a foot.

**Recent studies on the vitamin content of meats and meat products,** O. Mickelsen, K. A. Waisman, and C. A. Elvehjem. (Univ. Wis.). (*Jour. Amer. Dietet. Assoc.*, *15* (*1939*), *No.* 7, *pp.* 529–536).—This discussion is confined to the properties and distribution in meats and meat products of five members of the vitamin B complex, as studied in the authors' laboratory. Values are given for the content of vitamin $B_1$ in International Units in 1 gm. of dried tissue, the chick antidermatitis factor and factor W in percentages of the ration required for definite rate of growth of the experimental rats over a 6-week period, and riboflavin and nicotinic acid in gamma in 1 gm. of dried tissue. The materials listed for some or all of these constituents include beef brain, heart, kidney, liver, pancreas, round, and spleen; veal leg and liver; lamb leg and liver; pork ham (fresh and smoked), heart, kidney, liver, and loin; and light and dark meat of poultry. Vitamin $B_1$ was contained in highest concentration in the substances tested in the pork muscle; riboflavin, in beef kidney and liver and veal liver; and nicotinic acid, in lamb liver and in pork kidney and liver (not all of the materials listed were tested for nicotinic acid). Frying is considered to conserve the vitamin $B_1$ content better than other methods of cooking. Riboflavin is stable to most cooking processes, but it is noted that when foods are boiled in water the vitamin is separated from the proteins in which it is normally in combination and consequently may be lost in the cooking water. Nicotinic acid is not destroyed by ordinary cooking processes, but may be leached away to some extent in the cooking water. It is estimated that one fried pork chop may furnish as much as 325 I. U. of vitamin $B_1$ or one-third or more of the tentative requirement of 500 I. U.; 0.1 lb. of fresh liver or 1 lb. of fresh beef round the entire requirement (1,000–2,000 $\mu$g.) of riboflavin; and 0.25 lb. of fresh liver or 0.5 lb. of veal or lean pork the suggested nicotinic acid requirement of nicotinic acid.

**The effect of winter storage on the vitamin content of cabbage and onions,** H. L. Mayfield and J. E. Richardson (*Montana Sta. Bul. 379* (*1940*), *pp. 12, fig. 1*).—Cabbage of the Danish Ballhead variety raised on an irrigated farm in Gallatin Valley at an elevation of about 5,000 ft. was tested for its content of vitamins $B_1$ and C, both raw and cooked, before and after 6 months' winter storage in a home vegetable cellar with a temperature of approximately 45° F. and a relative humidity of about 55 percent. The vitamin $B_1$ tests were made by essentially the Chase and Sherman method, with the use in some of the later tests of graded doses of crystalline vitamin $B_1$ or the vitamin $B_1$ clay adsorbate as the standard of reference. Both biological and chemical tests were used for the vitamin C determinations. The cabbage was cooked by dropping coarsely cut material into a generous amount of boiling water and boiling for 10 min., after which it was drained, cut into smaller pieces, mixed, and used immediately.

The raw cabbage was estimated to furnish about 0.45 Sherman-Chase unit per gram in the fall and 0.40 unit after 6 months' storage. Corresponding values for cooked cabbage were 0.23 and 0.20 unit per gram. In International Units the values for raw cabbage before and after storage were 0.28 and 0.21 I. U. per gram and for fall samples of cooked cabbage 0.21 I. U. per gram. One gm. of raw and cooked cabbage tested in the fall and 1 of raw cabbage after storage afforded complete protection against scurvy in guinea pigs, but 2 gm. were required of the cooked cabbage in the spring. Average values obtained in the chemical tests were raw cabbage in the fall and spring 0.63 and

0.47 mg. of ascorbic acid per gram and cooked cabbage 0.35 and 0.27 mg. per gram, respectively.

A few tests are also reported for Sweet Spanish onions stored in the same way. In the vitamin $B_1$ tests quantitative values are given only for raw and cooked onions after storage, 0.11 and 0.13 I. U. per gram, respectively. In the biological vitamin C test 10 gm. of raw and cooked onions were required for protection in both fall and spring. The values obtained in the chemical tests were raw onions in fall and spring 0.127 and 0.123 mg. ascorbic acid per gram and cooked samples 0.065 and 0.085 mg. per gram, respectively.

In general terms in comparison with other vegetables, the cabbage tested is considered to be a good source of vitamin $B_1$, either raw or cooked, in the fall and after winter storage, and an excellent source of vitamin C, either raw or cooked, with only small losses on winter storage. Onions, on the other hand, are only a fair source of vitamins $B_1$ and C, with no loss of $B_1$ but a loss of about 50 percent of C on cooking. For the benefit of homemakers, estimates based on the chemical tests reported are given for the quantity of vitamin C in average servings of cabbage prepared for the table in different ways.

**Carotene (vitamin A) content of fresh and frosted peas,** C. R. Stimson, D. K. Tressler, and L. A. Maynard. (N. Y. State Expt. Sta.). (*Food Res., 4 (1939), No. 5, pp. 475–483*).—The peas used in this study were of the Thomas Laxton variety grown at the plant of a New York State packing company. Some of the freshly harvested peas were sieved to eliminate all except size No. 6. The peas thus graded and ungraded ones from the same lot were prepared for freezing and frozen according to the procedure customarily followed at the packing plant. Samples were taken for analysis at various stages through the freezing process and after storage at 0° and —40° F. for 9 and 11 mo. Carotene determinations on the fresh material were made by the Russell, Taylor, and Chichester modification of the Willstätter and Stoll acetone extraction procedure and also by the Peterson, Hughes, and Freeman modification of the alcohol potash procedure of Guilbert. All tests of the frozen material were made by the first of these methods, as the results were more uniform and checked well with bioassays by the U. S. P. XI method. On the fresh basis the International Unitages of vitamin A, as calculated from the carotene content, and the bio-assays agreed well, 6.1 I. U. of vitamin A for the former and 6.2 I. U. for the latter. The ratio of vitamin A: carotene was 1.48 in the graded peas and 1.51 in the ungraded, values which agree well with the theoretical value of 1.67.

The fresh peas before vining had an average carotene content by the acetone method of 5.2$\gamma$ per gram of fresh sample, after vining 4.9$\gamma$, and after blanching 5.9$\gamma$ per gram. Immediately after freezing the two samples of graded peas, which were to be stored at 0° and —40°, contained 4.6$\gamma$ and the ungraded stored at 0° 4.7$\gamma$ per gram. After 9 months' storage the corresponding values were 4$\gamma$, 4.4$\gamma$, and 3.8$\gamma$, and after 11 mo. 3.9$\gamma$, 4.5$\gamma$, and 4.1$\gamma$ per gram. Thus, the only appreciable losses in carotene content of the peas occurred during long storage of the frozen peas at 0°.

**The dark-adaptation test: Its reliability as a test for vitamin-A deficiency,** L. J. Harris and M. A. Abbasy (*Lancet [London], 1939, II, Nos. 26, pp. 1299–1305, figs. 4; 27, pp. 1355–1359*).—In this extension of earlier work by Maitra and Harris (E. S. R., 79, p. 712), the Birch-Hirschfeld photometer of the original model was used but with certain refinements in technic. All tests were carried out in a completely darkened room. More satisfactory illuminations during the light adaptation period were secured by using a screen covering a large area, directing the subject to look at a lightly marked circle in the center of the screen, and taking care to see that the eyes were kept open during the entire period.

During the dark adaptation the subject's head was covered with a hood opening into a cylindrical tunnel 9 in. in diameter and 2 ft. in length, at the end of which the photometer was placed. To minimize the learning factor each subject was given preliminary tests with the instrument until consistent readings were obtained. Other sources of error, with methods of avoiding or overcoming them, are discussed, and the results are reported of the application of the test to 100 boys 11–13 yr. of age in the upper forms of an elementary school in the poorest area in Cambridge, England, and on 30 boys of similar age in a children's home where the diet was considered to be exceptionally good.

Of the first group, 43 were judged normal, 34 slightly below normal, and 23 definitely subnormal in dark adaptation according to the arbitrary classification adopted. To check these findings, half of the boys in the slightly and difinitely subnormal groups were given halibut-liver oil in capsules furnishing 17,000 International Units of vitamin A daily for 2 weeks, at the end of which all had reached dark adaptation values within the normal range, while the untreated controls were all still within the subnormal range. Of the second group 28 gave normal values, 1 slightly below normal, and 1 definitely below normal. Both of the subjects giving subnormal values gave values within the normal range when tested after 3 weeks' treatment with 12,000 I. U. of vitamin A daily. In addition to these findings further evidence is presented in support of the belief that the method of dark adaptation tested is sound in principle, but that the apparatus and technic are capable of further improvement. It is emphasized, however, that the test is capable only of detecting deficiency and not of assessing different levels of normality. "Since the test is relatively intricate and needs experience and careful controlling, it is not suitable for rapid routine use by school medical officers. It can have its application in surveys on small selected samples of the population to confirm the supposition of deficient dietary intakes or for diagnosis in the clinic. Deficiency seems less common among adults than in children."

**An experimental determination of the minimum vitamin A requirements of normal adults**, L. E. Booher, E. C. Callison, and E. M. Hewston. (U. S. D. A.). (*Jour. Nutr., 17 (1939), No. 4, pp. 317–331, figs. 2*).—The Hecht adaptometer was used in this attempt to determine minimum vitamin A requirements of adults in terms of the number of International Units of the vitamin in the form of cod-liver oil or carotene required to maintain normal dark adaptation. After preliminary depletion to the point of "unmistakable signs of impaired dark adaptation," a 3-min. period of light adaptation, using a screen of 1,400 millilamberts intensity at a distance of 50 cm. directly in front of the subject, preceded the dark adaptation. The light source for determination of threshold values was a filament lamp calibrated at frequent intervals. Gradations in light intensity were obtained by the use of calibrated neutral filters and for the finer gradations with a carefully calibrated movable photometric wedge. The light used for the test spot was restricted to the violet region of the spectrum by a filter transmitting only wavelengths below 40°. The test spot was a circle whose diameter subtended a 3° visual angle. Three subjects were tested at a position 7° nasal, one central, and one 15° temporal. For three subjects the test was made with the right and for the other with the left eye. The light threshold data for the individual subjects are reported as average log micromicrolamberts after 6-min. and 30-min. adaptation periods. The sequence of values is reported graphically for only one of the subjects.

On a basal vitamin A-low diet estimated to furnish from 88 to 108 I. U. of vitamin A daily, the times required for depletion ranged from 16 to 124 days. The ingestion of cod-liver oil at this point induced temporary improve-

ment within 2 or 3 hr. Doses less than that required for normal adaptation improved the light sense with each dose for several days, at the end of which a stationary stage was reached. With increasing doses, a dose was finally reached for each subject on which normal threshold values could be maintained for a period of a week. With cod-liver oil this adequate intake ranged from 25 to 55 I. U., and with carotene from 43 to 103 I. U. per kilogram of body weight. In spite of the wide differences in the values for the individual subjects the ratio of requirement in terms of I. U. of carotene and vitamin A in cod-liver oil were remarkably constant, the carotene being from 50 to 60 percent as effective as the cod-liver oil.

**The estimation of free vitamin $B_1$ in pure preparations, food, and urine,** E. F. YANG and B. S. PLATT (*Chin. Jour. Physiol., 14 (1939), No. 3, pp. 259–268*).—The method detailed for the determination of vitamin $B_1$ employs the diazotized *p*-aminoacetophenone reagent of Prebluda and McCollum (E. S. R., 83, p. 10) applied to a methanol solution (or extract) of the vitamin at a pH of 12.1–12.25. The colored compound formed is extracted with petroleum ether, the depth of color of the extract being compared with that obtained by similar treatment of standard solutions of the pure vitamin. For estimations in urine the proteins are precipitated from a methanol-urine mixture by 40 percent lead acetate at pH 4.5, the filtrate being then decolorized with charcoal. The resulting solution, after adjustment of the pH, is used for the test. For estimation in foods, an acid methanol extract is prepared, the reagent being applied to this directly after the preliminary adjustment of the pH to the alkaline side.

Determinations of various dilutions prepared from commercial ampoules of the pure vitamin gave results about 30 percent higher than the values calculated for these dilutions, indicating probably a safety margin provided by the manufacturers.

The daily urinary excretion of four normal subjects unrestricted as to diet averaged 20γ, 32γ, 70γ, and 125γ, respectively, over 4-day periods, the daily variation being pronounced. Only traces of the vitamin could be found in the urine of patients clinically diagnosed as deficient in vitamin $B_1$. Estimations on a number of foodstuffs (rice, wheat flour, peanuts, horsebeans, soybeans, peas, and cabbage) gave values of the same order of magnitude as those obtained in earlier assays of the same foods [presumably different samples] by the bradycardia method.

**Observations on vitamin $B_1$ metabolism.—I, Urinary excretion by normal individuals and beriberi patients,** H. C. HOU and E. F. YANG (*Chin. Jour. Physiol., 14 (1939), No. 3, pp. 269–282, figs. 8*).—Using the method of Prebluda and McCollum as adapted by Yang and Platt (noted above), the authors determined the range of urinary excretion of vitamin $B_1$ by normal individuals (hospital staff and laboratory workers), surgical or nonberiberi medical patients, and beriberi patients, chiefly Chinese, from a large hospital in Shanghai. Observations were also made of the urinary excretion following the administration of vitamin $B_1$ either orally or parenterally.

The range of 24-hr. vitamin $B_1$ excretions of the 8 subjects comprising the normal controls was from 28γ to 176γ and of the 11 surgical and nonberiberi medical controls (5 cases) from 0γ to 66γ. In the normal subjects there was some evidence of seasonal fluctuations, with higher values in the winter than in the late summer. The tendency to low values in the second group was interpreted as indicating that the patients were potential beriberi cases of the latent type. This was supported by the great improvement in well-being which followed the administration of vitamin $B_1$. The urine of the beriberi patients contained no vitamin $B_1$, and in the severe cases a moderately large quantity (2–4 mg.) of

the vitamin administered parenterally did not give positive results. With doses of 3–6 mg. by mouth several days were often required before any vitamin $B_1$ could be recovered in the urine. In normal subjects a single dose of 2–5 mg. administered parenterally was followed by prompt excretion of the vitamin, which reached a maximum during the first hour and returned to normal levels within 5 hr. No definite relationship could be established between the output of urine and the quantity of vitamin $B_1$ excreted.

**Investigations on the vitamin $B_1$ content of blood in health and disease by means of a biological test with the fungus Phycomyces blakesleeanus** [trans. title], G. GUHR (*Klin. Wchnschr., 18 (1939), No. 30, pp. 1028–1031*).—The vitamin $B_1$ content of whole blood from a number of subjects was determined by the *Phycomyces* growth test, the details of which are outlined briefly. The subjects, on various uncontrolled diets described as normal, included healthy individuals, a group of pregnant women, a number of patients with cancer, and a few patients with various diseased conditions. Bloods from the majority of the healthy subjects contained from 8γ to 10γ percent of vitamin $B_1$, only traces being found, however, in the bloods of five sisters described as perfectly healthy with no symptoms referable to vitamin $B_1$ deficiency. The pregnant women, even those with pernicious vomiting, showed little difference from the normal subjects. Cancer patients, particularly those in a cachectic state, tended to show lower values than normal, although there were certain exceptions in that some of the patients in cachexia showed values above the normal range. Results with other patients having a variety of diseased conditions were variable.

**Thyroid and vitamin $B_1$**, R. A. PETERS and R. J. ROSSITER (*Biochem. Jour., 33 (1939), No. 7, pp. 1140–1150, figs. 3*).—Evidence is reported confirming the conclusions of others, including Cowgill and Palmieri (E. S. R., 70, p. 726), Sure and Buchanan (E. S. R., 78, p. 726), and Drill (E. S. R., 80, p. 563), that vitamin $B_1$ requirements are affected by the degree of thyroid activity. Subcutaneous injections of vitamin $B_1$ protected rats against loss of weight induced by thyroxine injections, and preliminary treatment with the vitamin in the same manner decreased the rate of loss in weight in rats subsequently fed thyroid extract. The catatorulin effect of vitamin $B_1$ was given by the brains of rats treated with thyroid but not by those of untreated rats on the same diet. The cocarboxylase values of boiled tissue extracts of rats treated with thyroid were intermediate between those from normal animals and animals with symptoms of vitamin $B_1$ deficiency. Subcutaneous injections of vitamin $B_1$ produced about the same increase in cocarboxylase values in normal and hyperthyroid animals, showing that in the presence of excess vitamin $B_1$ thyroid feeding does not appreciably decrease the cocarboxylase content of the tissues. In rats which had been pretreated with vitamin $B_1$ for 7 days, those which were subsequently given desiccated thyroid showed a more rapid fall in cocarboxylase than those left untreated.

**Activity of β-alanine in stimulating growth of young rats on a diet deficient in 'filtrate factor,'** M. HOFFER and T. REICHSTEIN (*Nature [London], 144 (1939), No. 3636, pp. 72, 73*).—In a study of the filtrate factor following the technic described by Edgar et al. (E. S. R., 82, p. 297), preliminary results gave some indication that β-alanine is capable of replacing the ether-soluble portion of the filtrate factor from liver, and suggesting that it may be identical with the chick antidermatitis factor or pantothenic acid. Slight increases in weight were obtained in rats fed 0.1 mg. β-alanine as a substitute for the ether-soluble portion of the filtrate factor.

**Vitamin B requirements of the rat**, M. M. EL-SADR, H. G. HIND, T. F. MACRAE, C. E. WORK, B. LYTHGOE, and A. R. TODD (*Nature [London], 144 (1939), No. 3636, pp. 73, 74*).—In a brief preliminary report the authors announce that

they have obtained evidence that the vitamin B complex as required by the rat contains at least six constituents. Young male rats were prepared as for tests for the filtrate factor and given as supplements aneurin (vitamin $B_1$), riboflavin, and the eluate factor (vitamin $B_6$), and after growth had ceased various additional supplements. The average increases in body weight during a 2-week period were as follows: No supplement 12 gm., purified liver filtrate factor (soluble in amyl alcohol) 43, acid-autoclaved whole extract of liver 36, purified liver filtrate factor+acid-autoclaved extract of liver 63, purified liver filtrate factor+the portion of liver extract not extracted by amyl alcohol and not absorbed by fuller's earth 64, and whole extract of liver 86 gm. These results are interpreted as follows:

"Consideration of the growth rates supported by the various supplements makes it clear that acid-autoclaved whole extract of liver contained an essential factor distinct from liver filtrate factor, and whole liver extract contained at least one further factor. The residue obtained after fuller's earth treatment, followed by amyl alcohol exraction of a liver extract, also contained a growth factor not present in our purified liver filtrate factor. Whether this is the same as that present in the acid-autoclaved extract of liver is undetermined." The growth effect of β-alanine fed at a dosage of 0.5 mg. was insignificant, indicating that this substance does not replace either the yeast filtrate factor or the liver filtrate factor.

**A note on the use of vitamin $B_6$ in human nutrition,** T. D. Spies, W. B. Bean, and W. F. Ashe (*Jour. Amer. Med. Assoc., 112 (1939), No. 23, pp. 2414, 2415*).—Evidence that vitamin $B_6$ is essential in human nutrition is presented in a brief report of its use in the treatment of certain symptoms formerly associated with pellagra or beriberi, but not yielding to treatment with nicotinic acid, thiamin chloride, and riboflavin. The symptoms include extreme nervousness, insomnia, irritability, abdominal pain, weakness, and difficulty in walking. Four persons complaining of these symptoms after treatment for pellagra and beriberi were given 50 mg. of pure synthetic vitamin $B_6$ in sterile physiologic salt solution. Relief was experienced within a short time and the symptoms disappeared entirely within 24 hr.

**Vitamin C synthesis and excretion by the rat,** R. R. Musulin, R. H. Tully, 3d, H. E. Longenecker, and C. G. King (*Jour. Biol. Chem., 129 (1939), No. 2, pp. 437–444*).—This is the complete report of an investigation noted from a preliminary report (E. S. R., 81, p. 150).

**An acceleration of vitamin C synthesis and excretion by feeding known organic compounds to rats,** H. E. Longenecker, R. R. Musulin, R. H. Tully, 3d, and C. G. King (*Jour. Biol. Chem., 129 (1939), No. 2, pp. 445–453, fig. 1*).—The substances tested in this extension of the investigation noted above included active lipides isolated from alfalfa meal and a series of aliphatic ketones, alcohols, aldehydes and mixed compounds, and cyclic ketones and alcohols.

The addition of 50 mg. of the most active fraction isolated from the unsaponifiable matter from dried alfalfa to a basal diet of evaporated milk raised the urinary excretion of ascorbic acid from 0.3 mg. per day to from 10 to 15 mg., and of 10 mg. to a level of about 5 mg. per day after 3 days. A number of compounds of widely different molecular constitution caused marked increases in the excretion of ascorbic acid. Of the pure and mixed aliphatic compounds tested, diisobutyl ketone, dipropyl ketone, and β-dimethylacetylcarbinol were relatively active, although the maximum average excretion with this group did not exceed 5.3 mg. daily. Terpene-like cyclic ketones were more effective than the aliphatic compounds, with carvone (both *d*- and *l*-) proving particularly effective. The feeding of 100 mg. of *d*-carvone daily resulted in average ascorbic acid excretion values

as high as 16.5 mg. per day and individual values as high as 20 mg. It is considered improbable that the effective substances served as direct precursors of ascorbic acid but rather as a stimulus to the synthesis of ascorbic acid from intermediate metabolites.

**The influence of pasteurization on the ascorbic acid (vitamin C) content of certified milk,** A. D. Holmes, F. Tripp, A. Woelffer, and G. H. Satterfield. (Univ. N. C. et al.). (*Jour. Amer. Dietet. Assoc., 15 (1939), No. 5, pp. 363–368, fig. 1*).—The milk used in this study was obtained at bimonthly intervals during a period of 18 mo. from a mixed herd of 110 Guernsey, 57 Holstein, and 8 Ayrshire cows maintained on a certified milk farm in Massachusetts. The cows were from 3 to 11 yr. of age and in practically all stages of lactation. Pooled milk from the entire day's product was analyzed for ascorbic acid by indophenol titration before and after pasteurization for 30 min. at 143° F. in stainless steel spray vats. The ascorbic acid content of the raw milk ranged from 14.12 mg. per liter on September 15, 1938, to 21.89 mg. on January 20, 1939, with an average for the 18 mo. of 17.26 mg. per liter. Minimum and maximum values for the pasteurized milk were 7.80 mg. per liter on August 11 and 18.98 mg. on January 20, with an average value of 14.03 mg. per liter for the entire period. The losses of ascorbic acid on pasteurization were much greater during warm than cool seasons. The greatest loss, 53.25 percent, occurred in August and the smallest, 4.3 percent, in March, with an average loss of 18.71 percent.

**Effect of irradiated milks on storage of nitrogen and acid-base minerals in children,** F. C. Hummel, H. A. Hunscher, I. G. Macy, et al. (*Amer. Jour. Diseases Children, 58 (1399), No. 4, pp. 753–767, fig. 1*).—Observations were made on the nitrogen and acid-base mineral storage of eight well children, 5–8 yr. of age, during test periods of 20–60 consecutive days under carefully controlled conditions. The influence of irradiated milk on this storage was studied, each child receiving first nonirradiated milk and later irradiated milk of the same kind and quantity and furnishing 90–95 U. S. P. units of vitamin D daily to the younger children and 180–190 units to the two older ones. Three of the children were given fluid milk, three evaporated milk, and two a combination of the two kinds. The methods of the study are discussed in some detail.

Results are tabulated to show for each child the average daily gain in height and weight during the periods of nonirradiated and irradiated milk consumption, and in these same periods the average daily intake and retention of calories, nitrogen, calcium, magnesium, sodium, potassium, phosphorus, sulfur, chlorine, and fat. For nitrogen, calcium, and phosphorus the range and percentage of retention are also given. All of the children showed a positive retention of the basic elements regardless of the type of milk ingested; all but two likewise showed a positive retention of all of the acidic elements. While taking irradiated milk all of the children showed an increased retention of calcium, although the utilization by the older children receiving the larger amount of calcium, 1.26 gm. daily, was less efficient than that of the younger children receiving only 0.72–0.80 gm. daily. The means of the daily retentions of calcium per kilogram of body weight varied over both periods from 2 to 10 mg., the average being 5.65 mg. per kilogram; with nonirradiated milk the average was 5.1 and with the irradiated 6.0 mg. This relatively small increase in retention effected by increased intake of vitamin D and the fact that the average retention was less than values usually postulated are not considered surprising, since the children were well prepared and nutritionally stable at the outset of the experiment.

Of the eight children, five showed higher calcium : phosphorus ratios during the period of irradiated milk, and all but one showed an increase in linear growth. These findings and the positive base balance in this period indicate

*that the vitamin D stimulated the rate of bone deposition.* All subjects but one showed decreased utilization of nitrogen while receiving irradiated milk, the percentage of nitrogen intake retained varying from 9.66 to 2.54 during the period of nonirradiated milk to values from 8.30 to 0.21 with the irradiated milk. In the former period some of the children were even storing the acidic elements in excess. Phosphorus and sulfur retentions also decreased during the ingestion of irradiated milk. These statistically significant decreases point to a shift in the type of tissue formed as a result of the vitamin D supplement from soft tissue with nonirradiated milk to skeletal tissue with irradiated milk.

The study seems to justify the conclusion "that vitamin D supplements in the form of irradiated milk included in a dietary known to be nutritionally good and given to children who have good health and good nutritive histories not only exert a regulating influence on the growth impulses but stimulate skeletal development."

**The use of irradiated evaporated milk in infant feeding,** R. W. B. Ellis (*Arch. Disease Childhood, 14 (1939), No. 80, pp. 295–306, figs. 7*).—A group of 20 normal full-term infants, 14 under 6 mo. of age at the beginning of the experiment, were given irradiated evaporated milk as the sole oral source of vitamin D during 6 mo. between October and April, and a group of 7 infants or young children (5 between 1 and 2 yr. of age) were treated for active rickets with the same milk as the sole source of vitamin D. The children receiving prophylactic treatment were in an out-patient clinic and the rachitic infants were in-patients. Clinical, biochemical, and radiological observations were made at stated intervals.

Of the larger group, 1 infant showed radiological evidence of mild active rickets and 2 of healed rickets at the end of 3 mo. Four had clinical signs suggesting rickets after from 3 to 6 mo. but no radiological changes. All of the group with active rickets showed evidence of progressive healing, beginning in from 1 to 3 weeks and becoming well advanced in from 4 to 5 weeks. One kept under observation for 10 weeks showed little progress in healing after about 6 weeks. The author concludes that, while irradiated evaporated milk is a valuable source of vitamin D, particularly in the case of infants who receive vitamin D supplements irregularly or in insufficient amounts, it should not be relied on as the sole source of this vitamin.

**Relation of skim milk feeding to cataract production,** C. F. Krewson, E. J. Schantz, and C. A. Elvehjem. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 2, pp. 573–576*).—Young rats were raised on mineralized whole milk until they weighed from 80 to 100 gm. and were then changed to a fresh mineralized skim milk, with and without supplements of galactose or lactose. All animals were irradiated for 10 min. daily and given 10 μg. of crystalline carotene in each 100 cc. of milk. The onset of cataract was determined by the first appearance of opacity in the lens of the eye.

In rats on mineralized skim milk without added sugars, cataracts did not develop in 150 days. In 90-day tests no cataracts developed in animals on the mineralized skim milk containing lactose or a mixture of equal parts of glucose and lactose to the extent of 70 percent of the solids or galactose to the extent of 20 percent. When the galactose was increased to 30 and 40 percent of the solids, cataracts developed in both eyes of all of the animals in from 28 to 30 and from 20 to 23 days, respectively. The addition of riboflavin in amounts of 100 μg. per rat per day did not delay the onset of cataracts on these diets.

In tests with a synthetic fat-free ration of ether-extracted casein and brewers' yeast and salts, with the same galactose and lactose supplements, the results were similar to those on the skim milk ration. Only 1 of 12 animals fed the

basal diet containing 70 percent lactose showed any signs of cataract. On the diet supplemented with 35 percent each of galactose and dextrin or glucose, bilateral cataracts appeared in all animals in from 28 to 30 days and on supplements of 60 percent galactose and 10 percent dextrin in from 17 to 20 days. The addition of 20 percent of fat to the ration containing 60 percent galactose had no effect except to dilute the ration and prolong by a day or two the onset of the cataracts.

It is concluded that the development of cataract in the rat is dependent upon the amount of galactose consumed, but that the rats used in the present study were less susceptible to this type of nutritional cataract than those used by Mitchell and Dodge, who first reported the development of cataract as a result of galactose or lactose feeding (E. S. R., 74, p. 418).

**Simultaneous appearance of a positive line test and radioactive phosphate deposition in the rachitic rat metaphysis,** K. Morgareidge and M. L. Manly (*Jour. Nutr., 18 (1939), No. 4, pp. 411–421, pl. 1, figs. 4*).—Young rachitic rats, given a single dose of $Na_2HPO_4$ furnishing 1–2 mg. of radioactive phosphorus ($P^{32}$), accompanied by a single dose (10–15 International Units) of crystalline vitamin $D_2$, were sacrificed at different intervals (2–96 hr.). Similar treatment was accorded control rats receiving the phosphorus but no vitamin D. The collected blood and sections of the tibial diaphysis and metaphysis were analyzed for their content of radioactive phosphorus, the bone sections having been first stained with silver nitrate and observed for any indication of healing, as evidenced by a positive line test. The findings, calculated to a basis showing the percentage of radioactive phosphorus dose per gram of whole tissue, are tabulated and plotted to show the results at different time intervals.

"The data show that vitamin D has no influence on the entrance of phosphorus into the blood or into the diaphyseal portion of the tibia. In the metaphysis, however, the healing produced by the vitamin (as shown by the appearance of a positive line test) occurs concomitantly with a significant increase in the content of the radioactive phosphorus. These effects in the metaphysis are seen only after the elapse of 54 to 72 hr. subsequent to the administration of the vitamin. It is pointed out that the results support the conclusion that the mode of action of vitamin D is not limited to the control of intestinal absorption of the elements concerned in calcification."

**The vitamin E activity of α-tocoquinone,** O. H. and G. A. Emerson and H. M. Evans. (Univ. Calif.). (*Jour. Biol. Chem., 131 (1939), No. 2, pp. 409–412, fig. 1*).—Two preparations of α-tocoquinone, assayed with young vitamin E-low female rats of proved sterility, were found to possess vitamin E potency substantially identical with that of α-tocopherol assayed as a control. The two samples of α-tocoquinone were prepared similarly by oxidation of natural α-tocopherol with ferric chloride in methanol solution, the quinone being separated from the reaction mixture after dilution by extraction with ether. Purification was effected by molecular distillation. Spectroscopic examination in one case and negative results with the phenol color reagent of Folin and Ciocalteu in the other showed these products to contain no trace of contaminating α-tocopherol.

**Vitamin K** (*Lancet [London], 1939, II, No. 23, pp. 1178, 1179*).—This editorial outlines briefly the progress in research on vitamin K from its discovery as a new dietary factor through the development of a method for biological assay and the preparation of a potent concentrate to the recent chemical work on identification and the therapeutic application of concentrates. Seventeen references are given.

**The vitamin K activity of 2-methyl-1,4-naphthoquinone and its clinical use in obstructive jaundice,** J. M. Macfie, A. L. Bacharach, and M. R. A.

CHANCE (*Brit. Med. Jour., No. 4120 (1939), pp. 1220–1223, figs. 5*).—Chicks on a vitamin K-free diet were given doses of the naphthoquinone varying from 0.4 to 3.2 μg. and administered direct to the gullet in four equal daily portions. Crude blood-clotting times, determined by a method outlined in detail, and prothrombin times measured by the method of Almquist and Klose (E. S. R., 82, p. 88) were determined on the test chicks and on controls receiving none of the naphthoquinone. The results, presented by table and by graph and analyzed for statistical significance, indicate that the 2-methyl-1,4-naphthoquinone was effective in reducing both the clotting and the prothrombin times, the former determination offering the better means of biological assay. Satisfactory results in these tests suggested the use of the compound in human therapy. When given by intramuscular injection to four cases of obstructive jaundice with low prothrombin indices, the results were striking, the index being raised considerably in every case within 2 days. In one case the change was evident within 12 hr. The authors suggest that this synthetic product may find effective use in raising the prothrombin index in cases of obstructive jaudice and in the treatment of postoperative bleeding in jaundice.

**The disturbance in blood clotting in obstructive jaundice and its elimination by vitamin K therapy** [trans. title], F. KOLLER and F. WUHRMANN (*Klin Wchnschr., 18 (1939), No. 31, pp. 1058–1060, fig. 1*).—A number of studies are discussed pointing to prothrombin deficiency as the basis of prolonged bleeding time associated with obstructive jaundice. A case report is presented, illustrating the effectiveness of vitamin K injected intramuscularly in large doses (250,000–1,000,000 units in three successive doses) in reducing to normal the blood clotting time of a patient showing severe hemorrhagic diathesis. The patient, made operable by this treatment coupled with blood transfusion and iron medication, staged an uneventful recovery after removal of a tumor at the head of the pancreas.

**Nutritional deficiency of vitamin K in man: A study of four nonjaundiced patients with dietary deficiency**, R. KARK and E. L. LOZNER (*Lancet [London], 1939, II, No. 23, pp. 1162, 1163, 1164, fig. 1*).—Each of the patients presented a history of dietary deficiency, with the development of scurvy in three and pellagra and subclinical scurvy in one. The prothrombin time in all cases was found to be prolonged. The patients, placed upon admission to the hospital on a diet containing insignificant amounts of vitamins C, B (complex), and (so far as is known) K, showed no increase in prothrombin level upon the regime. One patient given vitamin C therapy responded with an increase in the ascorbic acid level of the plasma, but showed no improvement in the prothrombin time. Ingestion of large doses of vitamin K without bile salts effected normal prothrombin times within 24 hr., the clotting time being still normal a month after 3 days of vitamin K therapy. These findings point to the possibility of dietary deficiency of vitamin K in man, with resulting prothrombin deficiency. The observations offer further evidence that nutritional deficiency in man is rarely confined to a single factor.

**Vitamin-K lack in normal and sick infants**, H. DAM, E. TAGE-HANSEN, and P. PLUM (*Lancet [London], 1939, II, No. 23, pp. 1157–1161, figs. 2*).—A study of normal infants, including some with neonatal jaundice and with slight degrees of hemorrhagic diathesis, showed a moderate reduction in the clotting power of their bloods associated with reduced concentration of prothrombin. A method is outlined for measuring the alteration in coagulation as evidenced by the reduction of the blood prothrombin. In these normal cases the reduced prothrombin level usually returns to normal within a few days, but it was demonstrated in two infants having approximately 12 and 25 percent of normal

prothrombin that intravenous injection of vitamin K could raise the levels in a short time, increases to 40 and 50 percent of normal, respectively, being attained within 4 hr. These results indicate that the decrease of prothrombin must be due to a vitamin K lack, which develops in the first few days after birth and thereafter ceases.

Case histories are presented for six infants with diseases belonging to the clinical triad of icterus gravis neonatorum, anemia neonatorum, and hydrops congenitus. In these a considerable hypoprothrombinemia was demonstrated. In two infants the administration of vitamin K (10,000 units by ingestion and 40,000 by intramuscular injection in one case and 4,000 units by intravenous injection in the other) resulted in a rapid increase in prothrombin, the level in the first case becoming normal within 2 days and in the second case considerably increased within 45 hr. In these patients a lack of vitamin K is indicated as the cause of hypoprothrombinemia.

## TEXTILES AND CLOTHING

**Consumer specifications for textiles**, M. B. Hays (*Jour. Home Econ.*, *31 (1939), No. 7, pp. 444–446*).—A chronological survey is given of the efforts, sponsored mainly by the American Standards Association and the American Society for Testing Materials, to establish standards for certain cotton textiles. At present there are tentative standards, not yet advanced to A. S. T. M. standards, for cotton sheeting, cotton broadcloths, and terry (turkish) toweling. These tentative standards published elsewhere[6] represent minimum specifications, those for the two latter materials being based on experimental data presented by the U. S. D. A. Bureau of Home Economics. The specifications for these three materials and certain proposed terms to designate the sheeting constructions are discussed briefly.

## HOME MANAGEMENT AND EQUIPMENT

**Family income and expenditures: Pacific Region, Plains and Mountain Region.—I, Family income**, D. Monroe, D. S. Martin, M. Perry, and K. Cronister (*U. S. Dept. Agr., Misc. Pub. 356 (1939), pp. IV+276, figs. 5*).—This report, the third of the series on family income and expenditures and representing part of the extensive consumer purchases study, is the first of the series on farm families. Information similar to that for the urban and village studies noted previously (E. S. R., 82, p. 287) is summarized and discussed, with adaptation to the special characteristics of the farm group.

**An analysis of family living data**, J. V. Coles (*Missouri Sta. Bul. 413 (1940), pp. 72, 73*).—Data are summarized on size of family and family income of a group of 288 families from Moberly.

**Some contrasts in levels of living in industrial, farm, and part-time farm families in rural Mississippi**, D. Dickins. (Miss. State Col.). (*Social Forces, 18 (1939), No. 2, pp. 247–255*).—This report, presented as an address, summarizes the information secured by personal interviews with the use of schedules. The three types of families noted are considered in five classes, from 40 to 49 families having been interviewed in each class. The industrial group in which both husband and wife were engaged in industrial work includes those families residing in mill villages and those residing in the country; the part-time farm group includes families in which the husband was a full-time

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[6] Amer. Soc. Testing Mater. Proc., 38 (1938), pt. 1, pp. 1157–1162.

farmer and the wife an industrial worker and those in which the husband was a part-time farmer and the wife a farm assistant; the farm group is represented only by a class in which the husband was a full-time farmer and his wife a farm assistant. A comparison is made of the several classes with respect to income (which is discussed in some detail), size of families, home ownership, adequacy of living space, household conveniences, proportion of income spent on food with general considerations of probable adequacy of diets, cash expenditures for items other than food, the percentage of families living within cash incomes, medical care and general health status, expenditures for reading matter, and participation in community social organizations. From the data examined it is considered that the part-time farm group was better off than the farm group in having a larger cash income and than the industrial group in having a generous supply of home-produced food. As a group they were thrifty, and relatively few showed a decrease in net worth during the schedule year

**Part-time industrial employment: A means toward better homes; surveys show need of supplemented income in poor areas,** D. DICKINS (*Miss. Farm Res.* [*Mississippi Sta.*], *3* (*1940*), *No. 3, pp. 1, 8*).—This brief report deals with contrasts in housing among the five groups compared in the investigation noted above. Considering only young families in poor areas, the author concludes that families in the open country with nonagricultural work, especially those families in which the wife was gainfully employed, were better housed than the other groups, and that such additional employment was necessary in order to buy a home and provide adequate space for various family functions.

**House cleaning management and methods,** C. W. MOFFETT (*U. S. Dept. Agr., Farmers' Bul. 1834* (*1940*), *pp. II+22, figs. 6*).—This is a revision of and supersedes Farmers' Bulletin 1180 (E. S. R., 44, p. 889).

## MISCELLANEOUS

**Research in agriculture: Work of the [Missouri] Agricultural Experiment Station during the year ending June 30, 1937,** F. B. MUMFORD, S. B. SHIRKY, ET AL. (*Missouri Sta. Bul. 413* (*1940*), *pp. 120, figs. 6*).—The experimental work not previously abstracted is mostly noted elsewhere in this issue.

**Forty-ninth Annual Report [of Washington Station], 1939,** E. C. JOHNSON ET AL. (*Washington Sta. Bul. 384* (*1939*), *pp. 101*).—The experimental work not previously referred to is mostly noted elsewhere in this issue.

**Report of agricultural research and other activities of the Western Washington Experiment Station for the fiscal year ended March 31, 1939,** J. W. KALKUS ET AL. (*Western Washington Sta. Rpt. 1939, pp. 54*).—The experimental work reported is for the most part noted elsewhere in this issue.

**Mississippi Farm Research, [March 1940]** (*Miss. Farm. Res.* [*Mississippi Sta*], *3* (*1940*), *No. 3, pp. 8, figs. 8*).—In addition to articles noted elsewhere in this issue, this number contains Fumigation of Corn Cribs to Prevent Damage by Weevils, by C. Lyle (p. 2), and Prepare Now for Hot Weather Yield of Pole Type Beans, by L. R. Farish (p. 2).

**Bimonthly Bulletin, [March 1940],** edited by W. C. PALMER (*North Dakota Sta. Bimo. Bul.*, *2* (*1940*), *No. 4, pp. 23, figs. 8*).—In addition to several articles noted elsewhere in this issue and the customary abstracts, this number contains Plants of the Buckwheat Family in North Dakota (pp. 5, 6) and Plant Identification Service (pp. 14–16), both by O. A. Stevens.

# NOTES

**Arkansas University and Station.**—Dr. Hereford Garland, instructor in horticulture and assistant in forestry, resigned effective June 1.

**Connecticut State Station.**—A contract has been let for the construction of three research greenhouses, each to be 25 by 58 ft., on the grounds of the station. One will be assigned to plant genetics, one to plant pathology, and one to entomology.

Dr. G. A. Zentmyer, Jr., of California, has been appointed research assistant in plant pathology to devote all of his time to investigations of the Dutch elm disease. He received his graduate degree from the University of California, and was formerly a member of the staff of the U. S. D. A. Bureau of Plant Industry at San Francisco.

**Maryland Station.**—Since the sad passing of Director J. E. Metzger, Dr. T. B. Symons has served as acting director. The work has been progressing satisfactorily through the cooperation of all of the station workers.

New barns are now being erected on the new 500-acre tract of land devoted to agronomy and horticulture work of the station.

The policy is being pursued of inviting advisory groups of about 50 leading men interested in the industries, such as agronomy, horticulture, entomology, animal husbandry, poultry, etc., to visit the institution occasionally. It is expected that these councils will meet once a year to go over the programs for the respective departments.

Dr. W. B. Kemp has recently been appointed head of the agronomy department, including all phases of the work in agronomy at the institution.

**Cornell University and Station.**—On June 29 the poultry building of the College of Agriculture and station was formally named Rice Hall. It is significant to note that this is the first college building in the country to be named in honor of a poultryman. During his 30 years of work at the university as head of the department, Emeritus Prof. James E. Rice molded the thought and activity of many engaged in the industry. He was an eminent teacher and contributed much toward the development of poultry research.

The speakers at the dedication included President Edmund E. Day of Cornell University; Dr. Carl E. Ladd, dean of the New York State Colleges of Agriculture and Home Economics and director of the experiment station; Dr. Liberty Hyde Bailey, former dean of the College of Agriculture; representatives of leading poultry interests; and Prof. Rice.

**Utah College and Station.**—Dr. R. H. Walker, who has been dean of the School of Agriculture and director of the station since April 1938, resigned as of July 1 to accept the directorship of the U. S. Regional Salinity Laboratory at Riverside, Calif. Dr. Walker is a graduate of the Brigham Young University and holds the Ph. D. degree from Iowa State College. He was a member of the soils department for several years at this institution, and later was conservationist at the Intermountain Forest and Range Experiment Station of the U. S. D. A. Forest Service before taking up his work in Utah. Dr. Walker was also at one time assistant agronomist at the Colorado State College.



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# EXPERIMENT STATION RECORD

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## CLOSER INTER-AMERICAN RELATIONS IN AGRICULTURAL EDUCATION AND RESEARCH

The need of closer relationships between the nations which occupy the Western Hemisphere is not only becoming increasingly recognized but there are plentiful indications of a desire to make tangible progress in achieving such relationships. Major attention is naturally being concentrated on the promotion of greater intercontinental solidarity in political and economic matters outside the scope of the present discussion. In addition, however, efforts are being made to broaden and intensify cultural relationships, both as a basis for a more thorough understanding and to facilitate the interchange of ideas and information. Agricultural education and research institutions are and should be actively interested in these developments.

As a step in this direction, attention is called to the recent appointment by Secretary Henry A. Wallace of a special committee on cooperation in agricultural education to be associated with the Federal Department of Agriculture. This committee consists of Assistant Dean Knowles Ryerson, College of Agriculture, University of California, chairman; Dr. E. N. Bressman, scientific adviser, U. S. Department of Agriculture, executive secretary; Dean J. G. Lee, Jr., College of Agriculture, Louisiana State University; Dean H. H. Hume, College of Agriculture, University of Florida; and Director Thomas Barbour, Museum of Comparative Zoology of Harvard University.

The committee was appointed at the suggestion of the Secretary of State and the continuation committee of the Conference on Inter-American Relations in the Field of Education. Its functions are announced as including the following: "(1) To indicate to the land-grant colleges the keen interest that is felt in the attention they give to the Latin American situation through the teaching of Spanish, making special provision for the needs of Latin American students, etc.; (2) show that although there are already some schools that are interesting themselves in the Latin American situation, there is still plenty of opportunity for others to serve; (3) point out the particular advantages of various schools; (4) exchange ideas and stimu-

late interest in agricultural education, not only for students from Latin America but also young North Americans interested in the Latin American field; and (5) explain the aims of the proposed Tropical Institute of Agriculture."

The majority representation on the committee of the land-grant colleges and universities indicates a belief that these institutions will be looked to for leadership as well as actual contacts. From this point of view it may be of value to recall that already considerable attention is being given along some of these lines. A cursory survey of their current catalogs as to provision for instruction in Spanish and Portuguese reveals that in 45 of the 48 land-grant colleges and universities admitting white students at least 3 courses are being offered in Spanish. This is also true, as would be expected, of the University of Puerto Rico. In addition, Spanish is being offered by 7 of the separate State colleges for Negroes.

Both the number and scope of courses vary widely between institutions. At one extreme are the 9 institutions offering a total of from 6 to 30 credits in beginners', intermediate, and advanced Spanish, mostly of nonspecialized content. Another group of about 20 institutions affords opportunity for more extended studies in Spanish literature and related fields, some of them rather specialized. The remaining 16 institutions, mostly though not exclusively State universities, provide a large number and a wide range of courses in the language and literature, of which many are of advanced grade and given in the graduate schools.

Courses designated as primarily or in part conversational are listed by 30 of the 48 institutions. In 7 are to be found courses in commercial Spanish, and in 1 special provision for scientific Spanish. Spanish American literature receives specific consideration in 14 colleges and universities. Two list courses in Spanish American civilization, and a like number deal with Latin American life, literature, and affairs.

As regards Portuguese, the opportunities are much more limited. Apparently only three land-grant institutions offer instruction at the present time, and of the eight courses provided only one seems to have in mind conversational Portuguese. Special mention may be made of a course in one university which is devoted to a survey of the literature of Brazil.

Obviously the provision of adequate courses would be only a beginning in developing closer contacts. Other means are suggested in a recent communication to a Washington newspaper by Mr. Joseph S. Edgerton. Writing from Buenos Aires while on an observational tour of South America, Mr. Edgerton says in part: "The best method of bringing about understanding between the Argentines and the North Americans, many leaders here believe, would be a free inter-

change of students and teachers in the colleges and universities of the two countries. The offering of scholarships in United States schools and colleges on a more general basis, as has been done by British and other European universities and individuals, to South American students probably would have far-reaching and exceedingly beneficial results, it is believed here."

These and many other possible points of contact will doubtless be considered by the committee on cooperation.

What may prove to be a substantial agency for the strengthening of relations in agricultural research is the new American Society of Agricultural Sciences. As noted in the July issue of the *Record*, this society was organized following the sessions of the Eighth American Science Congress. Additional information is now available concerning its composition and objectives which further emphasizes its potential importance.

As set forth in the constitution of the society, formulated on May 24, 1940, its objects are as follows: "(1) To recognize agriculture as a basic industry of the Americas and as an effective instrument in maintaining close and harmonious ties between the American Republics; (2) to advance scientific agriculture in the American Republics through individual and collective effort, through the development of active governmental support, and in other ways; (3) to provide a central organization for the coordination of the aims and efforts of the agricultural sciences in the American Republics; (4) to hold meetings, to issue publications, and otherwise to disseminate information related to agriculture and to provide for an exchange of research findings, ideas, and experiences among its members; (5) to promote solidarity and friendship among American workers in agricultural sciences and persons interested in the advancement of agricultural sciences in the American Republics."

To achieve these objects, three classes of members are provided. Active members, who alone are entitled to vote, hold office, and represent the society officially, are restricted to "persons professionally engaged in the agricultural sciences." Associate members are "persons interested in the advancement of the agricultural sciences, but not professionally engaged therein." Honorary members may be elected by the executive council of the society "in recognition of outstanding achievement in an agricultural science or distinguished service in the advancement of scientific agriculture." In addition to individuals, scientific organizations and other institutions whose work advances the objects of the society may be admitted to affiliation on such terms as may be prescribed by the bylaws.

In its internal composition, provision is made for a chapter in each of the American Republics represented in its active membership.

These chapters may hold meetings and function in other ways to promote the aims of the society in their respective countries.

A vice president of the society is to be elected by each chapter, and these vice presidents, together with the president and the secretary general, will constitute the council. This will be the supreme governing body of the society, with power to arrange for the issuance of publications and select places of meeting. An executive committee consisting of the president, one vice president selected by the council, and the secretary general is given power to administer the affairs of the society when the council is not in session. Permanent headquarters are designated as in Washington, D. C., and the treasurer is the treasurer of the Pan American Union. Annual dues are fixed at $2 for active and $1 for associate members.

The society sets up for the first time a continuing agency for the promotion of agricultural research in the Western Hemisphere, thereby supplementing the necessarily intermittent achievements of the Pan American scientific congresses with sessions at approximately 3-year intervals. Its usefulness is still to be demonstrated, and many obstacles will doubtless arise. Probably the measure of its success in the immediate future will depend in no small degree on the support received from research administrators, workers, and others directly concerned in the respective countries. Cooperation by the professional societies and their individual membership seems essential. The time appears to be propitious, and the possibilities for a worth-while service are intriguing. With adequate support and encouragement, the society may well develop into a link of great value in the lengthening chain of Inter-American relationships.

# RECENT WORK IN AGRICULTURAL SCIENCE

## AGRICULTURAL AND BIOLOGICAL CHEMISTRY

**The mathematics of elementary chemical calculations,** C. F. ROGERS. (Minn. Expt. Sta.). (*Math. Teacher, 32 (1939), No. 1, pp. 3–8; abs. in Minnesota Sta. Rpt. 1939, p. 51*).—Student difficulties in elementary chemical calculations are stated to be more mathematical than chemical. The arithmetical nature of the difficulties is specified and illustrated. The most common cause of trouble is the choice of a denominator and the use of that denominator either for the computation of percentage or the reduction of one quantity to unity in terms of another.

**The amino acid distribution in the proteins resulting from the thermal fractionation of wheat gluten,** L. S. STOCKELBACH and C. H. BAILEY. (Minn. Expt. Sta.). (*Cereal Chem., 15 (1938), No. 6, pp. 801–811*).—Wheat-gluten proteins may be fractionated by thermal treatment of the gluten dispersed in dilute acetic acid with 50 percent ethyl alcohol to give at least three fractions designated as glutenin, mesonin, and gliadin. The first of these fractions separated on standing at from 20° to 21° C., the second in like manner at from 12° to 14°, and the third at 4°. The visible characteristics indicated that the three fractions are dissimilar. Chemical analysis of the sulfuric acid hydrolysate disclosed significant differences between the glutenin and mesonin fractions. Humin, leucine, valine, phenylalanine, arginine, alanine, aspartic acid, and hydroxyvaline were appreciably higher in the glutenin than in the mesonin hydrolysate. Mesonin yielded more ammonia nitrogen, glutamic acid, proline, serine, and total bases than did glutenin, while it lacked cystine and yielded no acetone extract. The evidence obtained supports the view that wheat-flour gluten is constituted of more than two proteins.

**The colloidal behavior of flour doughs, V, VI.** (Minn. Expt. Sta.). (*Cereal Chem., 16 (1939), No. 2, pp. 265–271, fig. 1; pp. 271–279, figs. 4*).—The fifth and sixth papers of this series (E. S. R., 80, p. 581) deal with further studies on mobility, effects of various types of flours, and related observations.

V. *Comparison of the increase in mobility of doughs upon either prolonged mixing or fermentation with the effects of varied mixing times upon loaf characteristics,* M. C. Markley and C. H. Bailey.—Increase in mobility of doughs upon prolonged mixing was not significantly correlated with the decrease in bread scores resulting from similar treatment, nor with the increase in mobility due to prolonged fermentation in the instance of doughs prepared from a series of 23 spring-wheat flours of the 1933 crop. It appeared that increase in mobility of a dough upon prolonged mixing may be significant in the practical handling of doughs prepared from the same flour in a commercial shop when these relations are sufficiently established for the mixer and other mechanical facilities. Temporary partial reconstruction of the fermenting dough upon reworking appeared to be related to the production of optimum bread.

VI. *Dough formation from flours of diverse types*, M. C. Markley, C. H. Bailey, and F. L. Harrington.—In a study of dough formation in an extensive and diverse series of flours, the authors found that protein content and absorption were correlated with development time. Protein content was also correlated with absorption. A basis for the standardization of certain details of the baking test involving these relationships is suggested.

**Variations in dough-development curves,** C. O. Swanson. (Kans. Expt. Sta.). (*Cereal Chem., 16 (1939), No. 5, pp. 625–643, figs. 9*).—The various physical methods of testing and devices such as dough mixers recording the power used, the Hogarth mechanism, extensimeters, stress meters, etc., are discussed, together with the significance with reference to flour properties of the data obtained.

"The most serious aspect is that we have thus far no adequate method of evaluating these physical tests. It is a question whether we shall learn the interpretation of these physical tests as long as we use, as a standard, baking test methods based on formulas and procedures comparable to commercial practices. Such baking tests seem more or less to coddle the weak flours and do not give the strong ones a chance to show all of their possibilities. It may be that what we need is to get away from the idea of a commercially acceptable volume and texture and use a baking procedure the main purpose of which shall be to test the inherent possibilities the same as when engineers measure strength of materials."

**Effect of adding alpha- and beta-amylases to doughs,** O. E. Stamberg and C. H. Bailey. (Minn. Expt. Sta.). (*Cereal Chem., 16 (1939), No. 1, pp. 42–50, figs. 6*).—$\alpha$-Amylase in small quantities added to sugar-free doughs improved the bread considerably, but larger quantities of $\alpha$-amylase resulted in bread having inferior crumb, grain, and texture. $\beta$-Amylase in small or large quantities did not improve the bread. Enough of this enzyme appeared to be present in the flour. Addition of finely pulverized wheat starch to the flour improved only the crust color and "break" of the bread, but had a detrimental effect on the grain and texture and produced no increase in volume.

**Relation of mixing speed to dough development,** O. E. Stamberg and C. H. Bailey. (Minn. Expt. Sta.). (*Cereal Chem., 15 (1938), No. 6, pp. 739–748, figs. 3*).—For each speed of rotation of the mixing blade an optimum mixing time was found. This time was longer for a strong flour than for a medium strong. Doughs with 6 percent dry milk solids required longer mixing time than milk-free doughs. Thus the inclusion of dry milk solids has the same effect as using a stronger flour. This was especially evident with the medium-strength flour.

Bread scores from doughs mixed along the optimum-time curves were slightly higher at the medium speeds of 60 and 80 r. p. m. Slower speeds gave a rapid lowering in score, while speeds faster than 60 to 80 r. p. m. resulted in a less rapid decrease in score. When the optimum time of mixing was allowed, doughs with 6 percent dry milk solids showed a greater tolerance to variation in mixing speed than when the milk solids were omitted. Oven spring of most doughs increased with increased mixing and development until a highly overmixed condition was reached, when the oven spring began to decrease. Farinograms of doughs previously mixed in the variable-speed mixer indicated that the doughs mixed along the optimum-time curves had reached approximately the same stage of development in each instance. The point just before the peak of maximum plasticity on the farinograms appeared to be the stage of optimum development of a dough as far as baking quality was concerned. A medium to moderately high mixing speed resulted in superior bread. With reduced

speeds the bread was inferior even when the optimum time of mixing for that speed was allowed.

A study of work input in mixing doughs, as measured by a watt-hour meter, showed that when mixed along the optimum-time curves the work input was nearly the same, regardless of mixing speed. Strong flour doughs required more work for optimum development than doughs prepared with flours of medium strength. Doughs made with flour plus 6 percent of dry milk solids required more work in mixing than when the milk solids were omitted.

**The wheat-meal-time-fermentation test, II, III.** (Kans. Expt. Sta.). (*Cereal Chem. 16 (1939), Nos. 2, pp. 168–177; 3, pp. 365–376*).—Previous work (E. S. R., 80, p. 727) is continued.

II. *Effect of proteases, protease activators, and protease inhibitors*, C. O. Swanson and F. T. Dines.—Pepsin decreased the "time" of Tenmarq to less than one-half that required without this protease. On Clarkan, a normally short-time wheat, the effect was practically nil. Trypsin and papain appeared to have essentially the same effects as pepsin. On a series of soft wheats, of which the time is normally short, pepsin had no effect. In a series of hard and semihard wheats the reduction in time due to pepsin was proportional to the length of time for untreated samples. Pepsin reduced the time of flours to a degree similar to its effect on wheat meal. Cysteine-monohydrochloride reduced the time of Tenmarq but not that of Clarkan. This activator in combination with 0.5 mg. papain reduced the time on Tenmarq more than did pepsin alone, or cysteine alone. The combination also made a considerable reduction in the time of Clarkan. The protease inhibitor potassium bromate increased the time for Tenmarq 2.6 times and for Clarkan 1.5. The protease inhibitor ascorbic acid increased the time on Tenmarq apparently as much as did potassium bromate, and it made the time on Clarkan as long as the check time on Tenmarq. Pepsin reduced the time of spring wheats similarly to its reduction of winter wheat. Potassium bromate increased the time on these wheats beyond the limit of the accurate observation of the end point.

III. *Effect of bran, proteases, and activators on the "time" of flour*, C. O. Swanson.—Trials showed that the presence of wheat germ shortens the time of the flour; that bran increases the time; that adding pepsin to the flour, to mixtures of flour and untreated bran, to water-extracted bran, or to bran extract shortened the time as compared to that of the flour alone; and that cysteine-monohydrochloride also shortened the time for flour and bran mixtures, though not as much as did pepsin.

**A comparison of the Allis-Chalmers and the Buhler automatic experimental mills**, M. E. McCluggage, J. E. Anderson, and R. K. Larmour. (Kans. Expt. Sta. and U. S. D. A.). (*Cereal Chem., 16 (1939), No. 5, pp. 610–619, figs. 2*).—The following are among the conclusions reported: The variabilities of yield, ash, and diastatic activity are greater for the Buhler mill than for the Allis mill when the millers are skilled operators and the atmospheric conditions of the mill room are not controlled. These differences although not great are significant. With the milling room air conditioned and with both experienced and inexperienced millers, there were no significant differences between mills or millers, except that with respect to flour protein one miller had better results on the Allis mill.

"On the other hand, differences between wheats of different milling quality show up clearly with the Buhler mill when they may not be detectable by means of the Allis mill. Whatever the differences between the flours produced on the two mills, they were not great enough to be detected by the baking test. The greater speed and ease of operation of the Buhler mill, together with its very

compact construction, commend it to cereal technologists, especially where the volume of routine work is large."

**Maintaining a uniform temperature in an experimental baking oven,** K. F. Finney and M. A. Barmore. (U. S. D. A. and Kans. Expt. Sta.). (*Cereal Chem., 16 (1939), No. 2, pp. 289–292, fig. 1*).—Insulation of an experimental baking oven with a shredded asbestos mixture containing some binder effected a material reduction in heat lost by radiation. The installation on the rotating shelf of a series of side walls which moved successively under a stationary canopy immediately inside the door reduced the heat loss still further and markedly improved the uniformity of temperature within the oven. The temperature during the entire baking period from the first loaf to full oven load was maintained more uniformly when the refractory hearth (supplied with the oven) was used. A diagrammatic drawing indicates the nature of the added mechanical devices.

**Action of beta-amylase from soybeans on various starches,** V. D. Martin, N. M. Naylor, and R. M. Hixon. (Iowa Expt. Sta.). (*Cereal Chem., 16 (1939), No. 5, pp. 565–573, fig. 1*).—The nondigested portions of corn, wheat, rice, potato, and tapioca starches resulting from the action of soybean β-amylase yielded a flocculent, water-insoluble fraction and a gummy, water-soluble fraction precipitated by 70-percent alcohol. The reducing power, further hydrolysis by β-amylase, phosphorus and fatty acid content, and the precipitation of these fractions by iodine are reported upon. The flocculent material and the alcohol precipitate from any one kind of starch are apparently very similar. The physical natures of these preparations are very different, depending on whether they originate from cereal or root starches. The phosphorus and fatty acid groups do not appear to be the agents which block the action of β-amylase at 60–70 percent conversion of starch to maltose.

**Pectic enzymes.—I, The determination of pectin-methoxylase activity,** Z. I. Kertesz. (N. Y. State Expt. Sta.). (*Jour. Biol. Chem., 121 (1937), No. 2, pp. 589–598*).—When the pectin is demethoxylated the carboxyl groups of the pectin galacturonic acids are released and become titratable. The determination of the extent of demethoxylation effected by the enzyme based upon such a titration gave results in good agreement with those obtained by determining the unchanged methyl ester. The effects of the pH, substrate, and enzyme concentrations on the determination are discussed in the light of results obtained on a number of different materials as sources of the enzyme. The method is applicable for the determination of the pectin methoxylase in the presence of other enzymes acting upon the pectin.

Artificial polygalacturonic acid polymethyl ester is hydrolyzed by the enzyme at a velocity about 60 percent of that observed when pectin is used as the substrate. The rate of hydrolysis of α-methyl-*d*-galacturonic acid methyl ester is much lower, about 0.001 of the rate of hydrolysis of pectin. Two theories are advanced to explain these observations.

**Pectic enzymes.—II, Pectic enzymes of tomatoes; III, Heat inactivation of tomato pectin-methoxylase (pectase),** Z. I. Kertesz. (N. Y. State Expt. Sta.). (*Food Res., 3 (1938), No. 5, pp. 481–487; 4 (1939), No. 2, pp. 113–116, fig. 1*).—Pectin methoxylase (pectase) was found to be present in all tomato samples investigated. The activity found in green tomatoes is about 40–50 pectin-methoxylase units but increases to 80–120 pectin-methoxylase units as the fruit approaches maturity and reaches 180–190 pectin-methoxylase units in ripe field tomatoes. Pectin polygalacturonase (the most important enzyme of the pectinase complex) is practically absent from green tomatoes. In about half of the riper tomatoes investigated the enzyme could be found but with extremely

low activity. The changes in the viscosity (and quality) of cold-pressed tomato juice probably are not due to the decomposition of natural pectins by enzymes of the pectinase group but are caused entirely by the rapid enzymic demethoxylation of the pectin. The pectin methoxylase (pectase) of tomatoes is completely inactivated by heating the juice to 80° C. (176° F.) for 45 sec. The completeness of the inactivation can be easily determined by a simple test.

**Crystalline catalase,** J. B. SUMNER and A. L. DOUNCE. (Cornell Univ.). (*Jour. Biol. Chem., 121 (1937), No. 2, pp. 417–424, figs. 3*).—Isolated catalase has been in crystalline form and in pure condition. The enzyme is a compound of a protein either with hematin or with a substance closely related to it. The blue color which appears upon addition of acetone and hydrochloric acid "is perhaps produced by a compound intermediate in the formation of hemin, or possibly may be caused by a third substance." Beef catalase is isoelectric at pH 5.7.

**Crystalline anhydrous and monohydrated dl-glutamic acid,** M. S. DUNN and M. P. STODDARD. (Univ. Calif.). (*Jour. Biol. Chem., 121 (1937), No. 2, pp. 521–529, figs. 5*).—The authors obtained *dl*-glutamic acid monohydrate in approximately 48 percent yield by the dry heating of *d*-glutamic acid from commercial monosodium *d*-glutamate with ammonium chloride and hydrolysis of the resulting *dl*-α-pyrrolidonecarboxlyic acid by seedling, in recrystallization, with the plate crystals of the anhydrous form of the acid, under which conditions all crystallization took place in this form.

**Crystalline esters of vitamin A.—I, Preparation and properties; II, Biological potency** (*Biochem. Jour., 33 (1939), No. 4, pp. 589–600*).—The first part of this paper is by T. H. Mead and the second by S. W. F. Underhill and K. H. Coward.

Successful purification of vitamin A concentrates is reported. The vitamin A obtained in a high state of purity by distillation in the Hickman[1] cyclic still was crystallized directly from methyl alcohol at a low temperature. The stearate, 4-nitrobenzoate, diphenylacetate, and acetate were all prepared from highly purified vitamin A, but were not obtained as crystalline products.

The crystalline anthraquinone-2-carboxylate and the 2-naphthoate of vitamin A, prepared from material purified by molecular distillation, were assayed biologically and found to contain, respectively, 1,750,000 and 2,225,000 International Units per gram. Calculated from these figures, the potency of the vitamin A alcohol would be 3,181,000 I. U. per gram according to the tests on the first ester and 3,424,000 I. U. per gram according to tests on the second ester. "Since by definition, β-carotene contains 1,670,000 I. U. of vitamin A per gram, vitamin A itself is twice as active as β-carotene, weight for weight. The factor for converting the coefficient of absorption at 328 mμ into biological units per gram . . . was found to be about 2,000."

**The determination of the vitamin A- and the carotinoid content of 1 cc. or 2 cc. of blood,** J. C. LANZING (*Arch. Néerland. Physiol. Homme et Anim., 24 (1939), No. 1, pp. 112–121*).—The procedure involves saponification with 0.1–0.2 cc. of 60 percent potassium hydroxide for 15 min. on a boiling water bath, the mass being taken up in water and alcohol (0.5 cc. each) and extracted with several 5-cc. portions of petroleum ether. The combined extracts are washed with water, dried with anhydrous sodium sulfate, and made up to volume (25 cc.). An aliquot is evaporated nearly to dryness, transferred to a micro test tube, and evaporated to 0.2–0.3 cc., these operations being carried out in an atmosphere of carbon dioxide. The color imparted to the liquid by the carotenoids present is

[1] Indus. and Engin. Chem., 29 (1937), No. 9, pp. 968–975, figs. 10.

compared with colors of a number of standard solutions brought up to definite yellow values in the Lovibond tintometer and sealed in micro test tubes of the same diameter as that holding the test solution. Azobenzol in alcohol is recommended as a satisfactory color standard. After comparison of the yellow value, the extract still under carbon dioxide is evaporated to dryness, taken up in chloroform, evaporated again, made up to a volume of 0.02 cc. with chloroform, and treated with 0.2 cc. of antimony trichloride reagent. The blue color developed is compared with standard blue solutions brought to definite color values in the Lovibond tintometer, various dilutions of a solution of 5 gm. of $CuSO_4 5H_2O$+0.5 gm. of $Co(NO_3)_2$ in 50 cc. of water giving satisfactory blue standards.

Duplicate determinations with 1 or 2 cc. of the same blood were in good agreement, and it was found that microdeterminations on 2 cc. of the sample gave a good picture of the vitamin A and carotenoid content, as determined by macrodeterminations on 20 cc. of the same blood. By using 4–5 cc. of blood (±2 cc. of serum), the method is considered satisfactory for bloods containing a very low (less than 1 International Unit per 10 cc. of serum) concentration of vitamin A.

**Quantitative estimation of nicotinic acid in biological material,** E. Bandier (*Biochem. Jour., 33 (1939), No. 7, pp. 1130–1134*).—The method previously described (E. S. R., 82, p. 586) for analyzing dry yeast was found unsuitable for the determination of nicotinic acid in animal tissue. A modification suitable for such tissue is described which essentially consists in digestion of the material in 4 N NaOH, neutralization, and slight acidification of the mixture with concentrated HCl, and extraction of the liberated nicotinic acid with an excess of acetone. The extract is diluted with water, the acetone evaporated, and in the presence of $KH_2PO_4$, cyanogen bromide and metol (*p*-methylaminophenol sulfate) are added. The color developed after standing at least 1 hr. at room temperature protected from light is read off in a Pulfrich photometer (filter S 43) with a blank prepared simultaneously and containing the same amount of CNBr, $KH_2PO_4$, metol, and distilled water up to the standard volume of 20 cc. Details as to reagents and procedures are given.

The method is considered fairly specific, as small amounts of pyridine, picrolinic acid, α-picoline, trigonelline, or methylpyridinium chloride give no color when the analysis is carried out in the presence of a certain amount of $KH_2PO_4$. The quantitative recovery of added nicotinic acid indicates the reliability of the method. Results are presented for a series of analyses of pig and ox organs and tissues, as well as some of the organic preparations (designated by English trade names) used in the treatment of pellagra.

**Vitamin K from alfalfa** [trans. title], P. Karrer and A. Geiger (*Helvetica Chim. Acta, 22 (1939), No. 4, pp. 945–948, figs. 2*).—Evidence is cited for considering the vitamin K as prepared from alfalfa by Dam et al. (E. S. R., 82, p. 441) and which contained 20 million Dam units per gram to be a pure preparation. Its absorption spectrum was very similar to that of a sample of vitamin $K_2$ from putrefied fish meal, prepared and submitted for comparison by Doisy and which, according to a study credited to Dam, contained 8 to 9 million Dam units. Light yellow vitamin $K_1$ from alfalfa designated, according to a proposal of Dam, as α-phylloquinone was found to be labile toward light and easily reduced with sodium hyposulfite, the potentiometric curve being presented and the redox potential $E_m$ being given as +0.005 v. New analyses and molecular weight determinations indicated [illegible] or [illegible] and [illegible] or [illegible] as possible formulas. Upon catalytic reduction 4 molecules of hydrogen were absorbed, and evidence was obtained for the presence of several

C.$CH_3$ groups. The diacetate of the corresponding dihydroquinone was prepared, and possible formulas based on analyses and molecular weight determinations are suggested. Upon catalytic reduction of the compound 3 molecules of hydrogen were absorbed; the absorption curve of the resulting compound is presented.

**Synthesis of quinones related to vitamins $K_1$ and $K_2$,** L. F. Fieser, W. P. Campbell, and E. M. Fry (*Jour. Amer. Chem. Soc., 61 (1939), No. 8, pp. 2206–2218, figs. 4*).—The present paper gives the detail of observations summarized in previous reports (E. S. R., 83, p 15). Procedures of synthesis are presented at length. The chemical properties and absorption spectra and the results of bio-assays of synthetic model compounds are discussed. These are considered to lend support to the formulation of vitamin $K_1$ as 2-methyl-(or ethyl)-3-phytyl-1,4-naphthoquinone and of $K_2$ as 2,3-difarnesyl-1,4-naphthoquinone.

The formation of transient purple blue colors upon treating the synthetic models with alcoholic alkalies, a response similar to that noted by Dam et al. (E. S. R., 82, p. 441) with vitamin $K_1$ preparations, is interpreted theoretically as due to a tautomeric shift of hydrogen from the activated methylene group between the unsaturated quinone ring and the external double bond. This shift is typical of β- but not of α-alkyl substituted naphthoquinones. It was shown that the reaction in going to completion involved the replacement of the unsaturated side chain by hydroxyl. This accounts for the formation of the phthiocol-like pigment as the end product of the red-brown color reaction with vitamin K concentrates, and the pigment is probably phthiocol or the ethyl homologue.

**Potentiometric method for the accurate measurement of hydrogen-ion activity,** W. J. Hamer and S. F. Acree (*Jour. Res. Natl. Bur. Standards [U. S.], 23 (1939), No. 6, pp. 647–662, pls. 2, figs. 2*).—"A potentiometric method is described for measurements of hydrogen-ion activities in aqueous solutions. Galvanic cells without liquid junctions are used. In this method hydrogen and silver-silver chloride electrodes are placed in solutions to which known amounts of either sodium or potassium chloride have been added. A detailed description is given of the equipment and experimental procedures which are necessary for precise measurements of hydrogen-ion activities. The electromotive force of the galvanic cell, on the average, is reproducible to 0.02 mv., which is equivalent to 0.0003 pH unit. It is found that the electrodes function reversibly and exhibit no aging, hysteresis, or polarization effects. It is shown how the hydrogen-ion activity may be calculated from the electromotive force by thermodynamic methods, using the Nernst equation, in which the concepts of activity and interionic attraction are incorporated."

**A comparison of methods for the determination of soil reaction,** D. D. Mason and S. S. Obenshain. (Va. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 129–137, figs. 8*).—Using accuracy, cost, and general adaptability as criteria, the authors believe their results to indicate that "the LaMotte-Hester method [E. S. R., 78, p. 595] is best adapted for use under Virginia conditions where the facilities necessary for its operation are available." A modification of the Indiana method (E. S. R., 72, p. 303) was found to be the most accurate and cheapest method adapted to actual field use.

Of the laboratory methods evaluated, the results indicate that the glass-electrode method is preferable to the quinhydrone-electrode method on the Piedmont and limestone valley and uplands soils of Virginia, whereas there appears to be little choice between the two methods as applied to soils of the coastal plains province.

**Use of triethanolamine acetate-barium hydroxide buffer for the determination of some base exchange properties and lime requirement of soil,** A. Mehlich. (N. C. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 162–166, figs. 3*).—The author finds that a 0.2 N triethanolamine acetate-barium hydroxide solution buffered at approximately pH 8.15 has the advantages of barium hydroxide alone for the efficient neutralization of soil acids and the efficient replacement of soil bases, and avoids some disadvantages of barium hydroxide, notably the reaction of the latter with soil components other than base exchange materials and its ready formation of insoluble carbonate with carbon dioxide, provided this buffer solution is not raised above pH 8.2 by basic constituents present in the soil or added to it. Under these conditions, sulfate ions are quantitatively precipitated by the barium and they must be removed from the soil or corrected for.

A procedure for the application of triethanolamine acetate-barium hydroxide to the estimation of lime requirement of soil involves the determination of barium adsorbed by the soil (base or lime adsorptive capacity at approximately pH 8.15), titratable acidity, and replaceable magnesium. The barium adsorbed by the soil is determined by the difference in concentration of the test solution before and after treatment of the soil. This is accomplished rapidly and fairly accurately titrimetrically using tetrahydroxyquinone as the indicator. This method is considered particularly useful where lime applications based on pH data alone are likely to cause injury (overliming), and where it is essential to consider the nature of the liming material to be added with reference to magnesium deficiencies of the soil.

**A comparison of the dry combustion and the rapid dichromate titration methods for determining organic matter in soil,** G. M. Browning. (U. S. D. A. and W. Va. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 158–161*).—After correction of the data given by the rapid titration method by an appropriate factor, certain of the soils still showed considerable variation from the data obtained by the dry combustion method. "While dry combustion is probably the most reliable method available at present for determining the organic matter content of soils, the rapid titration method gives valuable approximate results even though the soils vary widely in origin, physical characteristics, and organic matter content."

**The quantitative determination of magnesium in soils using 8-hydroxyquinoline,** O. Alexander and H. J. Harper. (Okla. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 153–157, fig. 1*).—In a comparison of methods for the determination of exchangeable magnesium in soil by precipitation as 8-hydroxyquinolinate, it was found that the potassium bromate method gave positive errors which may not always appear in the final results because incomplete precipitation of magnesium 8-hydroxyquinolinate occurs in an oxalate solution. Aluminum may also cause a positive error unless it is completely removed before the magnesium is precipitated. A colorimetric procedure using a commercial type of photoelectric colorimeter to measure the color intensity of magnesium 8-hydroxyquinolinate dissolved in hydrochloric acid is recommended as a rapid and accurate method for the determination of small quantities of magnesium. Soils low in magnesium, as indicated by quick tests using Titan yellow as indicator, contain less than 15 mg. of exchangeable magnesium in 100 gm. of soil.

**Estimation of iodine in soils, plant material, and waters,** G. S. Fraps and J. F. Fudge. (Tex. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem., 23 (1940), No. 1, pp. 164–171*).—The method proposed is a colorimetric modification of that proposed by Trevorrow and Fashena (E. S. R., 74, p. 444). It consists of a pre-

liminary burning of the plant material, followed by an oxidation of organic matter by chromic acid, during which the iodine is oxidized to iodic acid, reduction of the iodic acid to iodine with phosphorous acid, and distillation of the iodine in a special all-glass apparatus. The iodine in the distillate may be liberated by means of nitrous acid and the color read directly, or it may be oxidized to iodic acid by treatment with bromine, the iodine liberated by a dilute solution of potassium iodide, the iodine extracted with carbon tetrachloride, and the color compared with a standard. The latter procedure is preferred.

**Removal of lead in maple syrup by means of base exchange material,** C. O. WILLITS and C. J. TRESSLER. (N. Y. State Expt. Sta.). (*Food Res., 4 (1939), No. 5, pp. 461–468*).—A carbon preparation chemically treated to give it base-exchange properties, and saturated with calcium, was shown to remove lead from maple sap through base exchange. It was further found that between the temperatures of 5° and 60° C. the amount of lead removed by the zeolite is independent of the temperature but dependent upon the contact time. By using a contact time of 1 min. the lead concentrations in maple sirup can be reduced from 36 p. p. m. to 1 p. p. m. or less. Percolating maple sap through calcium "Zeo-Karb" does not in any way alter the ash values of the sirup prepared from the sap.

**Determination of fat, moisture, and salt in soft cheese,** G. H. WILSTER ET AL. (*Jour. Dairy Sci., 23 (1940), No. 3, pp. 197–200*).—A report of the American Dairy Science Association subcommittee for the analysis of cheese on methods for sampling and analyses.

**Note on the Kjeldahl digestion of sugarcane juice,** L. G. DAVIDSON. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem., 23 (1940), No. 1, pp. 171, 172*).—Excessive and persistent foaming, met with in carrying out the determination in the ordinary way, were obviated almost entirely by heating the sample with the digestion mixture either to boiling or until foaming started, and then letting the mixture stand overnight before completing the digestion in the customary manner.

**Redox potential indicators in quality control of foods.—I, Correlation of resazurin reduction rates and bacterial plate counts as indices of the bacterial condition of fresh and frozen foods,** B. E. PROCTOR and D. G. GREENLIE (*Food Res., 4 (1939), No. 5, pp. 441–446, figs. 2*).—The use of a modified resazurin technic has definite possibilities in providing a fairly rapid and reasonably accurate means of detecting certain foods containing abnormally high bacterial populations. Extremely high bacterial counts may be detected in some foods in less than 0.5 hr., especially if the intermediate stage of resazurin reduction is used as an index. This method appears to be applicable to a number of foods, including hamburg steak and other comminuted meats, broken-out eggs, and other materials which may have high bacterial contents. It is believed that the method should prove useful to food-control officials and others interested in quality control, and it may be of advantage in certain food industries.

**The determination of neutral fat glycerol in blood with periodate: Application to the determination of arteriovenous differences in neutral fat,** L. VORIS, G. ELLIS, and L. A. MAYNARD. (Cornell Univ.). (*Jour. Biol. Chem., 133 (1940), No. 2, pp. 491–498*).—The method consists in adding the periodate reagent of prescribed concentration to the glycerol solution and allowing time for the reaction to become complete. The excess of $KIO_4$ is then determined by one of several titration procedures, as described. The difference between the titration value and that of a corresponding blank represents the

equivalent amount of the glycerol oxidized by the $KIO_4$. This method has been successfully applied to alcohol-ether extracts or acetnoe extracts of bovine blood plasma for measuring the neutral fat glycerol content of the blood. Quantitative data on simultaneously drawn arterial and venous blood samples from lactating cows indicate the removal of neutral fat from the blood by the secreting mammary gland.

**The electrometric determination of diastatic power of malts,** B. A. Burkhart. (Wis. Expt. Sta.). (*Cereal Chem., 16 (1939), No. 5, pp. 652–657*).—The reducing power of the digested starch solution is determined by adding 5 cc. of this solution to 10 cc. of a ferricyanide-ferrocyanide reagent and measuring the potential difference between a platinum electrode in this mixture and a like electrode immersed in 10 cc. of the reagent to which 5 cc. of water are added, the half cells being connected through a saturated potassium chloride agar gel bridge.

Advantages claimed for this procedure are that it is simple and requires no great technical skill. Only one reagent is required, which need not be standardized if pure salts are used in its preparation and the ferri- and ferrocyanides accurately weighed out. Any simple potentiometer is satisfactory provided it covers the necessary E. M. F. range. A modified quinhydrone pH meter was used for a large number of routine determinations, and, while not as accurate as a Leeds and Northrup potentiometer, it gave sufficiently accurate results for ordinary routine work. One operator can determine the reducing powers of 12 samples including blanks within 2 hr. or less after the enzyme hydrolysis is complete, whereas only from 4 to 6 samples could be completed in the same time with the A. S. B. C. procedure. The electrometric method compares favorably with the A. S. B. C. method and is sufficiently precise for use with routine samples.

**A comparison of methods for the determination of diastatic power of malts,** G. M. Burkert and A. D. Dickson. (Univ. Wis. and U. S. D. A.). (*Cereal Chem., 16 (1939), No. 5, pp. 657–660*).—The authors compared the standard A. S. B. C. method with the ferricyanide method used for flour by Blish and Sandstedt (E. S. R., 74, p. 589) and a modification of the last-named method in which a ceric sulfate titration is used. The Blish and Sandstedt flour method was only a little more accurate than the other two procedures, but was enough faster to give it an advantage for routine work.

**The use of calcium in the commercial canning of whole tomatoes,** Z. I. Kertesz, T. G. Tolman, J. D. Loconti, and E. H. Ruyle (*New York State Sta. Tech. Bul. 252 (1940), pp. 22, fig. 1*).—The treatment of canned whole tomatoes with small quantities of calcium chloride improves the firmness of the fruit and increases the number of tomatoes which remain whole in the can. Mechanical shaking tests indicated that the calcium treatment increases the resistance of canned tomatoes to physical damage normally occurring during shipping, and increases also drained weight and the proportion of whole tomatoes in the can.

At least three methods may be used in the calcium treatment, namely, the dipping of the peeled fruit into a solution of calcium chloride prior to canning, the addition of calcium chloride in the can, and the use of combination salt tablets containing calcium chloride. The comparative advantages and disadvantages of these methods, as well as their relative costs, are discussed in detail.

**[Potato byproduct investigations of the Maine Station]** (*Maine Sta. Bul. 397 (1939), pp. 817–821*).—C. A. Brautlecht discusses the construction of two large-capacity modern starch factories in Aroostook County, analyses for total

carbohydrates, employment of sulfur dioxide in the potato-starch process, uses of starches, and starch production.

**Problems of silage,** C. F. ROGERS. (Minn. Expt. Sta.). (*Natl. Assoc. Silo Mfrs., Ann. Proc., 26 (1938), pp. 93–116; abs. in Minnesota Sta. Rpt. 1939, p. 51*).—This is a restatement for the information of silo manufacturers of the problems of silage making, the fundamental processes of silage formation being reviewed and related to the silo itself.

**Investigations on the physical and chemical properties of beeswax,** C. S. BISSON, G. H. VANSELL, and W. B. DYE. (Coop. Calif. Expt. Sta.) (*U. S. Dept. Agr., Tech. Bul. 716 (1940), pp. 24, figs. 2*).—The physical and chemical properties of 60 samples of crude beeswax, obtained for the most part from Western States, have been determined. These properties have been compared with those of freshly secreted scale wax and also with the properties of many of the same waxes after they had been decolorized by various processes. For freshly secreted beeswax the properties were nearly constant, but with changes in the quantity and kind of contaminating impurities some or all of these properties changed. The physical and chemical properties of the impurities, and not of the waxes as a whole, should, therefore, in the authors' opinion, be used as the basis for classifying crude beeswaxes.

Dilute acids removed a part of the color of dark waxes but did not remove the yellow color. Treatment with solutions of iron salts combined with treatment with an adsorbent filtering aid resulted in white waxes, although treatment with the iron salts alone, without subsequent adsorbent treatment, was detrimental.

**The origin and mechanism of adhesion in wood plastics,** A. J. BAILEY. (Minn. Expt. Sta.). (*Mod. Plastics, 15 (1938), No. 11, pp. 39, 40, 66, figs. 3*).—The adhesive function of lignin and cellulose was studied by etching thin sections of dense fiberboards with suitable solvents. Removal of cellulose destroyed the structure while removal of lignin effected little change. Thin sections of paper containing high and low lignin contents behaved similarly, as did also the same sheets of paper. To show that cellulose was responsible for the adhesion, fiberboards were prepared from purified pulp by pressing at room temperature. The resulting boards had properties similar to the commercial product containing lignin. The relation of these findings to industrial processing is pointed out, and changes, such as beating and chemical gelatinization, are recommended to increase strength.

**Fold failure in kraft paper,** A. J. BAILEY. (Minn. Expt. Sta.). (*Paper Indus. and Paper World, 21 (1939), No. 2, pp. 156–160, figs. 11*).—The mechanism of folding was studied by means of sections across folds, including single folds, double folds, and bending. Other types of folds, such as sigmoid and V folds, were observed and classified. A complete series of folds from normal paper to complete failure, in seven steps, was studied in detail and illustrated by means of photomicrographs. Other types of folds were similarly treated. The features associated with high folding strength are enumerated, and the ideal properties of stuff and sheet are discussed from the viewpoint of raising folding strength by means of such modifying processing variables as cooking, bleaching, beating, and formation.

## AGRICULTURAL METEOROLOGY

**Ground rainfall under vegetative canopy of crops,** J. L. HAYNES. (U. S. D. A. and N. J. Expt. Stas.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 3, pp. 176–184, figs. 4*).—Measurements of ground rainfall under various crop canopies during a 3-yr. period of study indicated that interception increased directly with

vegetative cover, that intensity of ground rainfall is in general less than that of actual precipitation, that distribution of ground rainfall is influenced by the character of vegetative growth, that a portion of ground rainfall under crops having stems or stalks is conducted to the ground by the plant stem, and that foliage cover, density, height, and character of vegetative growth appear to contribute to the effect of vegetative canopy on character and amount of ground rainfall.

**Conduction of rainfall by plant stems in a tropical rain forest,** P. D. Voth (*Bot. Gaz., 101 (1939), No. 2, pp. 328–340, figs. 2*). For 13 days water draining down stems of woody plants growing on Barro Colorado Island, Canal Zone, was collected in cups and measured, the amount collected being calculated to inches of water on the basis of net area of the cup and expressed as percentage of the rain water collected by the official gage. A leafless control stem, equipped with a collecting cup, collected 80–104.2 percent as much water as the rain gage. Cups on stems of *Annona* and *Myriocarpa* trees, the first in a clearing and the second in the rain forest, collected 6–7 times more water than the rain gage. Cups in tandem on a stem of *Nothopanax* collected an amount of water consistent with their position. The smaller upper cup, catching water flowing down the leaves and smaller branches of the trimmed crown, averaged 2.5 times as much water as recorded by the rain gage. The lower and larger cup into which water from a short portion of the stem and from a lateral group of leaves drained averaged slightly more than one-third as much water as the rain gage. These plants possessed well-developed mats of leafy liverworts and lichens. It appears conclusive that during the rainy season in a tropical rain forest area an amount of water flows down the stems of woody plants sufficient to support a copious growth of epiphytes. There are 19 references.

**The present trend in evaporation experiments,** C. Rohwer. (U. S. D. A.). (*Iowa Univ. Studies Engin. Bul. 20 (1940), pp. 81–91*).—Evaporation studies concern the determination of evaporation loss and the relation of the evaporation to certain meteorological factors or thermodynamic laws as well as the evaporation loss. The latter type is of greater scientific value, and the trend is said to be more and more in this direction. Studies of this kind by Federal and State agencies are discussed. As a result of this work more accurate and complete information is becoming available, and at the same time the laws governing evaporation are becoming better known and new facts based on the fundamental relationship between evaporation and the physical factors are being discovered.

**Serious water shortage predicted unless there is abundance of precipitation before May 1: Value of snow surveys in estimating water supply explained,** G. D. Clyde (*Farm and Home Sci. [Utah Sta.], 1 (1940), No. 1, pp. 1, 8, fig. 1*).—In Utah, the basic industry agriculture depends largely on the irrigation water supply, which current snow surveys are said to indicate will be ±65–75 percent of the normal in 1940. The author explains the value of snow surveys in securing the necessary basic data for analysis of precipitation-runoff relationships for advance estimation of the water supply. These studies were begun by the station in 1923, and, with increasing cooperation by Federal agencies there are now 83 snow courses being measured annually in Utah and ±700 in the 11 Western States. Information from such surveys is regarded as fundamental to a program of maximum land and water use.

**Flood forecasting in the upper Mississippi Valley,** B. S. Barnes. (U. S. D. A.). (*Iowa Univ. Studies Engin. Bul. 20 (1940), pp. 230–239, figs. 2*).—A general discussion of the factors involved, practical results obtained, and plans

for future developments in the study of the behavior of storm waters for forecasting for up-river and down-river points.

**Stage transmission in the lower Mississippi River,** G. H. Matthes (*Iowa Univ. Studies Engin. Bul. 20 (1940), pp. 240–247, figs. 5*).—*A summary of studies* of the rate of speed with which changes in stage are transmitted down the lower Mississippi River.

**Photo-electric measurements of daylight under Alpine conditions,** W. R. G. Atkins and M. Rothschild (*Quart. Jour. Roy. Met. Soc. [London], 66 (1940), No. 283, pp. 13–21, figs. 2*).—Observations were made with vacuum sodium and with rectifier selenium photoelectric cells, under opal flashed glass diffusing plates. Sodium cell measurements at $+0.41\mu$ gave the reflection from the snow as being 0.74–1.19 times the vertical component of mixed daylight. With a selenium cell, sensitive throughout the spectrum, observations ranged from 0.68 to 0.88. Calculated on the maximum values for mixed daylight, the snow reflections were 0.38–0.74 and 0.28–0.38, respectively, for the sodium and selenium cells. Under Alpine conditions there was relatively less scattered light from the sky, consequently the sun: sky ratio was greater in the violet than in England or Ceylon for the same solar altitude. With the selenium cell, the sun: sky ratio was even greater. The vertical component of daylight was higher in the violet, under Alpine conditions, but the difference was less at higher solar altitudes. For measurements covering the whole spectrum, the Alpine values were also noticeably higher. The physiological effects of Alpine sunlight are said to be due partly to the intensity of the reflected light.

**The effect of radiation on psychrometric readings,** D. Dropkin (*Cornell Engin. Expt. Sta. Bul. 26 (1939), pp. 60, figs. 10*).—The effect of radiation on the dry-bulb temperature is said to be large and not to be neglected in accurate psychrometric work. The true temperature of the air and the true wet-bulb temperature are computed from equations given. The coefficient of emissivity of the bulb of the mercury-glass thermometer, in the assumed temperature range, was found to be 0.632. The radiation error cannot be given as a percentage of the wet-bulb depression without stating the wet-bulb temperature.

**A simple sky radiation recorder,** D. J. Maclean (*Jour. Sci. Instruments, 17 (1940), No. 2, pp. 40, 41, figs. 2*).—A photocell in a special mounting was used in conjunction with a Cambridge thread recorder to give a continuous record of the intensity of sky radiation.

**Direction-finding of sources of atmospherics and South African meteorology,** B. F. J. Schonland, D. B. Hodges, et al. (*Quart. Jour. Roy. Met. Soc. [London], 66 (1940), No. 283, pp. 23–41, figs. 9*).—This is an account of investigations (15 mo.) of the location of sources of atmospherics in South Africa with visually operated cathode ray direction finders. The accuracy with which a thunderstorm source could be located by this method proved to be ±50 km. for storms at distances less than 750 km. At greater distances the accuracy decreased, but was usually less than ±100 km. at 1,500 km. Of the land sources, 76 percent were identified with thunder clouds and 18 percent with nimbus clouds. Sources over the oceans were closely associated with areas of low pressure, 89 percent of such lows having associated sources. The progress of lows could be followed by this method for several days. The monthly and seasonal disturbances of sources over the land agreed with those found by Brooks from thunderstorm data, except that over the Indian Ocean the number of atmospherics sources reached a maximum in winter. The possibilities of the device for meteorology in South Africa and the difficulties encountered in its practical use are discussed.

**The speed of cyclones over the North American Continent,** H. LANDSBERG and C. C. DINGER. (Pa. State Col.). (*Pa. Acad. Sci. Proc., 13 (1939), pp. 116–120*).—A considerable retardation was found for long-path cyclones over the central portion of North America, which was partly an effect of the swerving of cyclones from the zones endowed with the highest potential circulation energy. This deflection from a straight west-east path was, in winter, connected with the steering effect of the Great Basin High. The cause of the deflection in summer is not yet known, but the retardation during that season is connected with a southward movement of the cyclones. Low pressure areas moving straight from west to east in summer showed an acceleration in accordance with the prevailing radiation and heat absorption conditions.

**Meteorological observations** (*Maine Sta. Bul. 397 (1939), pp. 839–843*).—General summaries of meteorological records for 1938 and for January–June 1939 are presented for Orono and Presque Isle, and rainfall records for Highmoor Farm, May–October 1939.

**Study of comparative climatology with applications to the Republic of Mexico: Provisional classification of its climate,** P. C. SANCHEZ (*Estudio de climatologia comparada con aplicaciones a la Republica Mexicana: Clasificacion provisional de sus climas. Tacubaya: [Mex.] Sec. Agr. y Fomento, 1936, pp. 13+[7], [pls. 10]*).

## SOILS—FERTILIZERS

**[Soil investigations of the Wisconsin Station]** (*Wisconsin Sta. Bul. 449 (1940), pp. 3–6, 15, 16, figs. 3*).—Grass as a remedy for small gullies is taken up by O. E. Hays (coop. U. S. D. A.), who discusses water diversion and seeding, sodding the entire gulley, and the use of sod hump dams. A low-cost, home-made sod cutter is described. A new boron test is briefly reported upon by K. C. Berger and E. Truog.

**[Soil Survey Reports, 1934, 1935, and 1936 Series]** (*U. S. Dept. Agr., Bur. Plant Indus. [Soil Survey Rpts.], Ser. 1934, Nos. 17, pp. 64, pls. 2, figs. 2, map 1; 20, pp. 39, figs. 2, map 1; 1935, No. 14, pp. 55, figs. 2, map 1; 1936, No. 2, pp. 71, pls. 3, figs. 3, map 1*).—Except as indicated below, these surveys were made in cooperation with the respective State experiment stations: 1934, Nos. 17, Otsego County, N. Y., W. E. Tharp et al. ([N. Y.] Cornell), and 20, Stokes County, N. C., W. A. Davis and E. F. Goldston (coop. N. C. Dept. Agr.); 1935, No. 14, Albemarle County, Va., R. E. Devereux et al.; and 1936, No. 2, Major County, Okla., W. H. Buckhannan et al.

**Physical characteristics of soils, III–VI** (*Soil Sci., 47 (1939), No. 5, pp. 415–423, figs. 5; 48 (1939), Nos. 2, pp. 149–160, figs. 2; 6, pp. 505–520, figs. 5; 49 (1940), No. 3, pp. 239–249, figs. 5*).—Further work in this series of investigations (E. S. R., 81, p. 173) is reported.

III. *Heat of wetting,* A. N. Puri and R. C. Hoon.—Heat of wetting values of single-base soils in equilibrium with different relative humidities were measured. The results indicate that soils in equilibrium with relative humidity over 90 percent show scarcely any heat of wetting. There is a significant correlation between the heat of wetting and the air-dry moisture content of soils.

IV. *Density gradients in sedimenting columns and a chaino-hydrometer for mechanical analysis of soils,* A. N. and B. R. Puri.—From an examination of the density gradients in suspensions of 150 soils, it is concluded that any section 10–12 cm. in length and situated 5 cm. below the surface of the settling column has an average density which is equal to the density at its middle point. This fact makes it possible to measure the density and hence the percentage of particles at any point in a settling column with a hydrometer. For this purpose, a

chaino-hydrometer of high sensitivity with a chainometric attachment has been devised, and its use for the mechanical analysis of soils is discussed.

V. *The capillary tube hypothesis of soil moisture*, A. N. Puri.—In this paper the author shows evidence in support of the capillary tube hypothesis of soil moisture. "Determination of capillary force of soils by measuring the maximum height to which moisture can rise is fundamentally wrong. This can be done only by completely saturating the soil and applying gradually increasing suction pressure until the capillaries break. This force is correlated with the size of particles as demanded by theory."

VI. *Influence of clay, exchangeable bases, and hygroscopic moisture on soil cohesion*, A. N. Puri, A. G. Asghar, and A. N. Dua.—This study extends the work on soil moisture. Cohesion for the same percentage of clay rapidly falls as the particle size increases up to a limit beyond which the effect of size of particles becomes negligible. In single-base soils, the order of cohesion for the dry soil follows the generally accepted order of dissociation for these ions. The single-base soils used in these experiments were prepared by first removing all exchangeable bases and then securing full saturation with the cations of lithium, sodium, potassium, magnesium, calcium, strontium, and barium hydroxides, respectively. The H-ion saturated soil was also included in the material used for the cohesion experiments.

**A revised method for the microscopic examination of natural structure and pore space in soils**, G. W. Volk and H. J. Harper. (Okla. Expt. Sta.). (*Soil Sci.*, *48 (1939), No. 2, pp. 141–147, pl. 1*).—Difficulties in applying their first method (E. S. R., 79, p. 303), in which the soil was impregnated with lacquer, to certain soils containing coarse, hard particles, have been overcome by the authors in a modified method in which Bakelite varnish is used to cement soil particles together in order that clods of soil can be ground to thin sections for microscopic examination. Lacquer is satisfactory when soils do not contain grains of sand, which must be cemented firmly to prevent their dislodgment during the grinding process. Of 15 commercial materials studied, only 4 were suitable for attaching the polished surface of a cemented clod to a glass slide. A method for the study and estimation of noncapillary pore space by filling the pores appearing in the polished face of a clod with white casein paste is also proposed. The authors find that a study of undisturbed samples of soil under low and high magnification will give accurate information in regard to the character and amount of noncapillary pore space and other physical factors, such as soil granulation, distribution of soil concretions, and the dispersion of soil organic matter, which cannot be obtained by indirect methods of physical analysis.

**An electrical resistance method for the continuous measurement of soil moisture under field conditions**, G. J. Bouyoucos and A. H. Mick (*Michigan Sta. Tech. Bul. 172 (1940), pp. 38, figs. 13*).—The authors describe an electrical resistance method of measuring soil moisture in situ under field conditions, which appears to be an elaboration and extension of the set-up and procedure previously reported upon by them (E. S. R., 81, p. 326). Porous blocks, cast about pairs of electrodes, are imbedded in the soil. The moisture content of the absorbent material varies with that of the soil. Its electrical resistance varies inversely as its moisture content. Absorption blocks of plaster of paris proved to have many desirable characteristics, such as expansion upon setting (which provides a satisfactory electrode interface), a wide moisture range, and the property of absorbing and losing water rapidly. Laboratory and field studies indicated that these blocks are mechanically strong and may survive years' use, since they are neither crumbled by root growth, broken by freezing, nor dissolved.

A portable alternating current bridge operating at a high audible frequency and using a pair of headphones as the null point indicator has been devised to measure the resistance of the blocks. The apparatus was shown to measure soil moisture between the wilting coefficient and the field capacity. Changes in the salt content of ordinary soils did not appear to interfere with these measurements. It was shown that blocks made of relatively insoluble materials like clay are markedly influenced by changes in the salt concentration of the absorbed solution. Lacking the solubility of calcium sulfate, these materials do not exhibit the buffering characteristics of plaster of paris. Constant low resistance indicates that the moisture level is at or above the field capacity. As the soil loses its available moisture the resistance of the block increases to about 60,000–75,000 ohms at the wilting point. Accurate moisture determinations were found to be obtained by calibrating the apparatus for every soil. The approximate experimental error varied from 0.1 to 1 percent. After the blocks have been installed, only a few seconds are necessary to determine the block resistance.

**Infiltration and capillary rise in sandy soils,** W. M. Johnson. (Minn. Expt. Sta.). (*Minn. Acad. Sci. Proc., 6 (1938), pp. 44–51*).—The author presents a discussion of the effects of surface tension on capillary rise of water in soils and its relation to infiltration. It was shown that naturally decaying organic matter, urea, and other contents of soils affect the capillary rise of water.

**Primary minerals of the silt fraction as contributors to the exchangeable-base level of acid soils,** E. R. Graham. (Mo. Expt. Sta.). (*Soil Sci., 49 (1940), No. 4, pp. 277–281, fig. 1*).—This study of the influence of hydrogen clay on the metathesis of the bases from the structure of primary minerals of the silt size indicated that in the comparatively short time interval of 107 days calcium can be transposed from the crystal of anorthite to the exchange atmosphere of hydrogen colloidal clay in such quantities as to change the pH of soil clay from 3.30 to 5.70; that the H ion of the colloid can also bring about calcium removal from the crystals of hornblende and augite; that biotite and microcline are little affected by the action of the H ion sorbed in the exchange atmosphere of colloid clay; and that the action of sorbed H ions of the clay brought about a weathering effect on the mineral crystal significant enough to remove 3.4 percent of the total calcium held in the anorthite mineral. The hydrogen clay thus appears as a very active agent in the weathering processes, causing approximately 100 times as much calcium to be removed from anorthite as was removed by the hydrolytic action of water.

**Rapid soil tests used on plots of a vegetable soil acidity experiment,** J. D. Hartman. (Cornell Univ.) (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 138–145, figs. 3*).—The rapid tests, whether on soil extracts made with 0.1 percent acetic acid or with the Dahlberg and Brown (E. S. R., 67, p. 652) acetic buffer, indicated much greater availability of calcium, magnesium, and phosphoric acid on plats of high pH than on plats of low pH. The reverse was true for iron and aluminum. Ammonia nitrogen was more abundant, for a period after fertilizer containing ammonia was added, on the more acid plats than on those nearer neutrality. Significant changes in pH and in quantities of all extracted ions took place during the season. Seasonal fluctuations in extracted phosphoric acid and iron and aluminum were not, however, closely correlated with seasonal fluctuations in acidity. Seasonal fluctuations in extracted calcium and magnesium were negatively correlated with seasonal fluctuations in pH. The tests showed little or no increase in phosphoric acid and potash following the application of fertilizer containing these materials, indicating that although increases would probably have been found if adjacent fertilized and unfer-

tilized areas had been tested at the same date, such increases were too small to be detectable when superimposed on major seasonal fluctuations. Either extracting solution dissolved nearly all the phosphoric acid from superphosphate and potash from muriate of potash. It appears that the process of shaking up the soil with the extracting solution serves to dissolve and bring the recently added potash and phosphoric acid thoroughly into contact with adsorbing colloids and quickly to establish an equilibrium between adsorbed and dissolved phosphate and potassium ions. The results indicated that probably most of the response to added fertilizer on this soil is obtained by virtue of its localization either in bands or in particles, if broadcast.

The accuracy of the tests, that is, the possibility of obtaining satisfactorily similar results upon repetition of the extraction and test, seems good enough for practical purposes except in the case of phosphoric acid with the 0.1-percent acetic extraction and, perhaps, that of potash with either extraction.

The acetate buffer solution removed considerably larger quantities of cations than did the weak acetic acid and somewhat more phosphoric acid.

**Chemical studies on soils from Florida citrus groves,** M. Peech (*Florida Sta. Bul. 340 (1939), pp. 50, figs. 3*).—This bulletin reports upon a chemical study of approximately 100 soils covering a wide range of grove conditions in the important citrus areas of the State. The work included the determination of the exchange capacity; percentage of base saturation; exchangeable calcium, magnesium, potassium, manganese, zinc, and copper; phosphorus soluble in sulfuric acid (0.002 N); water-soluble phosphorus; total nitrogen; nitrate nitrogen; organic matter (loss on ignition); and soil reaction (pH). The chemical data presented show the variations in composition among the different soil samples within the same series, as well as the minimum, the maximum, and the average amounts of the various constituents found in the different soil series.

"The well-drained upland soils of the State that are most extensively planted to citrus, commonly known as blackjack lands and high pinelands, including Norfolk, Blanton, Eustis, and Lakewood series, have a very low exchange capacity, usually between 2 and 3 milliequivalents per 100 gm. The base-exchange property of these soils is largely determined by their organic matter content as shown by the constancy of the ratios, exchange capacity/percent organic matter. The exchange capacity increased approximately by 2.0 m. e. per unit increase in the percentage of organic matter. It was found that the exchange capacity affords the best single-value index to the relative potential fertility of the various soils planted to citrus. The average value for the exchange capacity of the different soil series varied from 2.7 to 8.6 m. e. per 100 gm. in the surface layer.

"A fair general relationship was found between the degree of base saturation and the pH values in both surface and subsoil samples showing a wide variation in exchange capacity. From the data on the exchange capacity, total sum of exchangeable bases, and the pH, the average pK value of both the surface and the subsoil samples examined was calculated to be 5.5, which was found closely equal to the pH value at 50 percent base saturation. . . . The use of sufficient basic materials to maintain the soil reaction at about pH 6.0, which corresponds approximately to 75 percent base saturation, is being tentatively recommended for best results.

"Most of the light sandy soils examined were found very deficient in magnesium, manganese, zinc, and copper."

**Soil tests,** D. S. Fink and A. J. Bouchard (*Maine Sta. Bul. 397 (1939), pp. 783, 784*).—Analyses are summarized of more than 5,000 soil samples for acidity and available plant-food content.

**Characteristics of some forest soils developed on the young red (Patrician) drift,** C. O. Rost and O. C. Soine. (Minn. Expt. Sta.). (*Minn. Acad. Sci. Proc., 6 (1938), pp. 59–64*).—Samples from typical profiles of Milaca very fine sandy loam, Askov very fine sandy loam, and Cloquet very fine sandy loam were analyzed for reaction, total nitrogen, total phosphorus, soluble iron, and exchangeable hydrogen, calcium, magnesium, sodium, and potassium.

Regardless of their position in the profile all samples were acid. The pH values were lowest in samples from the $A_2$ horizon and rose somewhat with depth. The pH range was from 4.7 to 5.8. The total nitrogen varied from 0.06 percent at the surface to 0.01 percent in the C horizon. The total phosphorus was low in samples from all types and showed little variation throughout the profile. The average amount was approximately 0.07 percent $P_2O_5$. Exchangeable H constituted more than 50 percent of the total exchangeable bases in half of the soils. The range was from 31 to 70 percent. Ordinarily the exchangeable calcium exceeded exchangeable magnesium, but in some instances the reverse was observed. Exchangeable potassium was highest in the A horizon, approximately normal percentages being present in two types. In the third type, Cloquet very fine sandy loam, it was distinctly higher than in the other two. Exchangeable sodium was low in all types. Analysis of samples from the $A_2$ and $A_3$ horizons indicated that the yellowish-brown or tan color of the $A_3$ was due to the presence of larger amounts of soluble iron. Color determinations showed that yellow reached its maximum in the $A_3$ or $B_1$ horizon. Both determinations indicate that the yellowish-brown color is due to the presence of iron compounds.

**The influence of grazing upon certain soil and climatic conditions in farm woodlands,** R. F. Chandler, Jr. (Cornell Univ.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 3, pp. 216–230, figs. 6*).—In a study of soil and climatic conditions in 18 paired grazed and ungrazed woodland areas, no significant differences in pH of the surface soil were found. The soil organic-matter content averaged 8.5 percent in the ungrazed as compared with 6.4 percent for the grazed areas, while the respective volume weights averaged 0.92 and 1.15. The moisture equivalent was higher in the ungrazed areas and correlated well with soil organic-matter content. The moisture content of the soil was highest on the ungrazed areas, whether expressed as percentage of oven-dry soil or as relative wetness. Air and surface-soil temperatures were highest in the grazed areas. The quantity of light penetrating the forest canopy was much greater in the grazed wood lots, averaging 21 percent of full sunlight as compared with only 3.03 percent in the ungrazed areas. The relative humidity of the air was 65.7 percent in the ungrazed as compared with only 53.6 percent for the grazed woodlands.

**Origin and properties of alkaline raw humus,** H. M. Galloway. (Wis. Expt. Sta.). (*Soil Sci., 49 (1940), No. 4, pp. 295–301, pl. 1, fig. 1*).—A rare type of alkaline raw humus, originating chiefly from the remains of white cedar, balsam fir, and ground vegetation ordinarily associated with strongly acid soils, was found on calcareous outcrops of Door Peninsula in the Podzol Belt of Wisconsin. The dark-brown, matted, peatlike duff layer varied in thickness from 4 to 10 in., grading into highly dispersed black organic matter, mixed with particles of limestone and underlain by a somewhat weathered rock substratum.

The chemical composition of the duff horizon is characterized by an average reaction of pH 7.5, exchange capacity of about 110 milligram equivalents per 100 gm. with base saturation approaching 100 percent, and a C: N ratio of 15.9. A high content of total CaO (5.9 percent) and a low content of available phosphorus (0.004 percent) were among the more notable findings. Fractionation

showed low contents of the ether-, water-, and alcohol-soluble materials and a very low content of cellulose (2.65 percent), but rather high contents of hemicelluloses (9.22 percent) and lignin (38.52 percent). It is pointed out that these data suggest that, genetically, alkaline raw humus occupies an intermediate position between acid raw humus and low-moor peat.

Biological activity, as determined by the carbon dioxide evolution method, lies between that of the acid hemlock raw humus and that of slightly acid hardwood-hemlock duff of a mull nature.

**The effect of erosion on losses of soil organic matter,** C. S. SLATER and E. A. CARLETON. (U. S. D. A. and N. Y. State Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 123–128, figs. 2*).—The authors have shown a correlation between the decrease in organic-matter content of a series of plant soils and the extent of the erosion. Determinable depletion occurred only at the higher erosion rates. The observed results led to the inference that many reported depletions of organic matter, formerly attributed to oxidation, may have been erosional effects.

In the soils examined, depletion of organic matter appeared to be a linear function of erosion. The organic-matter percentage of the soil dropped 0.002 percent at both the Clarinda and Bethany stations for each ton of soil lost by erosion. It is shown that the amount of organic matter removed by erosion is greater than the corresponding depletion indicated by analyses of the plat soils, so that restoration to an original organic-matter level does not compensate for losses of "reserve" organic matter. In a fallow plat on which the greatest erosion occurred, it was estimated that erosion had increased the depletion of organic matter to 18 times that normally lost by oxidation, and that to maintain the organic matter at the original level it would be necessary to apply as much as 9.2 tons per acre of clover hay annually.

**Microbial activity in relation to soil aggregation,** T. C. PEELE. (U. S. D. A. and S. C. Expt. Sta.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 3, pp. 204–212, figs. 4*).—The author finds that "the mucus produced by bacteria was . . . an effective binding agent in the formation of water-stable soil granules. Bacterial mucus from Austrian field pea nodule bacteria and various other bacterial species grown on artificial media produced water-stable aggregates when incorporated with soil . . . whether the soil contained a large amount of clay or consisted entirely of quartz sand."

The addition of sucrose to soil containing bacteria or fungi, followed by an incubation period, caused a marked increase in percentage of large water-stable granules. When sucrose was incorporated with soil under sterile conditions and the soil maintained free of micro-organisms, it had no effect on aggregation. A fungus culture was much more effective than a bacterial culture in producing water-stable granules under aseptic conditions, but it is considered probable that this relationship varies with different species of either class of organisms. The activities of micro-organisms appeared to be of much greater importance in connection with soil structure than has heretofore been supposed.

**Survival of microorganisms introduced into soil,** H. KATZNELSON. (N. J. Expt. Stas.). (*Soil Sci., 49 (1940), No. 4, pp. 283–293*).—A number of typical soil bacteria, fungi, and actinomycetes were inoculated into five soils of varying organic-matter content and pH values. All the organisms introduced into the soil decreased in number, three (*Pseudomonas fluorescens, Fusarium culmorum,* and *Actinomyces cellulosae*) disappearing completely. An attempt was made to establish these three organisms in soils treated with alfalfa, straw, manure, and dried blood, with and without lime. *P. fluorescens* usually persisted in largest numbers in soils to which dried blood or alfalfa was added. In acid soils, the

correction of the reaction enabled the organism to survive. *F. culmorum* survived most consistently in soils with added alfalfa but without calcium carbonate. Little correlation was noted between the persistence of *A. cellulosae* and the treatments applied. The soils which harbored *P. fluorescens* and *F. culmorum* in greatest numbers were the most active microbiologically.

**The role of algae in the nitrogen cycle of the soil,** J. L. Stokes. (N. J. Expt. Stas.). (*Soil Sci., 49 (1940), No. 4, pp. 265–275*).—In the presence of actively growing cultures of nine strains of Chlorophyceae, *Azotobacter chroococcum* failed to make appreciable growth under conditions such that the sole limiting factor was a supply of available carbon and energy, indicating that the algae supplied *Azotobacter* with little or no available organic matter. The algae liberated into the surrounding medium, in most cases, amounted to less than 10 percent of the total carbon assimilated by the algae. The most important probable factor in connection with the limited growth of the bacterium, however, is believed to be the unavailability of even this part of the organic matter. As a result of this and similar experiments, it is concluded that the indirect role of the majority of soil algae in the fixation of atmospheric nitrogen either is nonexistent or exists only to a very small extent. "Blue-green algae must be considered as direct participants in the fixation of nitrogen in the soil. Their practical importance, however, still remains to be determined."

**Growth of Cunninghamella blakesleeana as influenced by forms of nitrogen and phosphorus under varying conditions,** A. Mehlich. (Wis. Expt. Sta.). (*Soil Sci., 48 (1939), No. 2, pp. 121–133, figs. 5*).—The nutrition of *C. blakesleeana* (minus strain), particularly as regards the suitability of different forms of nitrogen and phosphorus under various conditions, was investigated in both sand and soil cultures. The sand cultures were buffered at different pH values by means of hydrogen- and potassium-saturated bentonites.

The nitrate nitrogen promoted the growth of *C. blakesleeana* equally well over a pH range from 2.9 to 8.6. The ammonium form, urea, and calurea produced good growth above pH 5 but appreciably less growth with increasing acidity. Glycine and aspartic acid gave a maximum growth over a wide range of reaction. Arginine and glutamic acid appeared to produce least growth near the pH values of their isoelectric points. Cystine was found to be a poor source of nitrogen for *C. blakesleeana*. The fungus was able to make fairly good growth on some complex nitrogenous materials and organic fertilizers believed probably to contain easily mineralized nitrogen. Water-soluble phosphates promoted growth equally well over the range pH 2.9 to 8.6. The utilization of slightly soluble or water-insoluble phosphates varied with reaction. Fairly good growth was obtained on some forms of water-insoluble phosphates. Organic forms of phosphorus were utilized largely in proportion to the ease with which they can be mineralized. Growth in the presence of water-soluble phosphate was reduced over a wide range of reaction in the presence of 4 percent limonite, goethite, or aluminum oxide. Freshly precipitated aluminum hydroxide reduced growth markedly at a slight acid reaction. Large quantities of calcium carbonate reduced growth significantly, but lower concentrations had less effect, especially in the presence of potassium bentonite or a soluble potassium salt.

**Hydrolysis of urea in soils by thermolabile catalysis,** J. P. Conrad. (Univ. Calif.). (*Soil Sci., 49 (1940), No. 4, pp. 253–263, figs. 2*).—In experiments with preheated Yolo fine sandy loam, marked reductions in various concentrations of urea solutions were noted in the first percolates and less in the second ones, a result considered best explained on the basis of adsorption of the urea by the soil. Later percolates had nearly the same concentration as the respective original solutions. With untreated soil and with soil under toluene, reductions in

concentration also occurred with the first percolates, but the reductions in successively later ones leveled off and became nearly constant. These constant reductions with a constant rate of percolation are assignable to a catalytic activity in the soil, thermolabile in that it was inactivated by preheating. Wide variations in the concentration of urea percolated through untreated soil had very little effect on this catalytic activity as measured by reductions in the concentration of urea. The reduction in concentration was substantially proportional to the length of time between the successive additions of the urea solutions. In soil preheated to render it devoid of the thermolabile catalytic activity, adsorption plotted logarithmically against the equilibrium concentrations gave points very close to a straight line, indicating true adsorption. Urea adsorbed by preheated soil was substantially recovered by subsequent leaching with water.

In incubation trials preheated soil under toluene produced but little ammonia from urea; preheated soil without toluene produced somewhat more; normal soil under toluene produced much more, almost as much as normal soil without toluene. Reinoculating the preheated soil with about 0.1 percent of normal soil had but little effect on the amount of ammonia formed, these experiments indicating that in the soil studied the hydrolysis of urea resulted much more from catalysis than from the direct simultaneous action of the soil micro-organisms themselves.

**The transformation of phosphorus during the decomposition of plant materials,** S. C. CHANG. (N. J. Expt. Stas.). (*Soil Sci., 48 (1939), No. 2, pp. 85–99, fig. 1*).—The author studied the transformation of phosphorus during the microbiological decomposition of alfalfa and wheat at three stages of growth.

In the early stages of decomposition of the plant materials much organic phosphorus was synthesized by micro-organisms at the expense of the inorganic phosphorus, irrespective of the nature and the stage of growth of the plants. As decomposition progressed the organic complexes of phosphorus were gradually mineralized, at a rate dependent upon the stage of growth rather than upon the nature of the plant. The addition of dipotassium phosphate to mature straw compost markedly increased the decomposition of the straw, as shown by the amount of material decomposed and by the rate of $CO_2$ evolution. More inorganic phosphorus was transformed to organic forms during the decomposition of old materials than during the decomposition of young materials. As much as seven times the original content of organic phosphorus was found in straw compost receiving 5.131 percent $K_2HPO_4$ for 60 days of incubation. In straw receiving no phosphate or only a small amount of phosphate there was no evidence of mineralization of the organic phosphorus during 116 days of decomposition. Appreciable mineralization of organic phosphorus was apparent only in materials treated with large amounts of phosphate. The fractions of the straw most affected by the phosphate applications appeared to be the cellulose and hemicelluloses. The decomposition of both fractions was considerable where phosphate was added, whereas the percentages of cold water-soluble organic matter and lignin were virtually unchanged during the period of decomposition.

**Availability of fixed potassium to plants,** L. KOLODNY and W. R. ROBBINS. (N. J. Expt. Stas.). (*Soil Sci., 49 (1940), No. 4, pp. 303–313, pl. 1*).—Tomato plants were grown in sand cultures to study the availability of fixed potassium as compared with exchangeable potassium and to compare the availability of these sources of potassium with that present in untreated bentonite and with that of a complete nutrient solution. Fixed potassium consisted of that potassium undisplaceable by calcium ions after alternate wetting and drying of potassium-saturated Wyoming bentonite. Exchangeable potassium was provided by saturation of the untreated bentonite with potassium by the usual methods.

Fixed potassium was utilizable for growth by tomato plants to but a slight extent. It was not nearly so readily available to tomato plants as was exchangeable potassium or the potassium of untreated bentonite, but it became available to the tomato plants to a slight extent apparently by means of root action, perhaps either by carbonic acid excretion or by means of direct contact exchange between roots and the bentonite sample containing this form of potassium.

**The behavior of boron in soils**, F. M. EATON and L. V. WILCOX. (*U. S. Dept. Agr., Tech. Bul. 696 (1939), pp. 58, pl. 1, figs. 5*).—It is indicated that concentrations of boron insufficient to support normal plant growth are usually below 0.1 to 0.5 p. p. m. Concentrations so high as to cause injury are usually in excess of from 0.5 to 5 p. p. m. Plant species and varieties show a wide variation in their boron requirements and in their boron tolerances.

In the irrigated soils used for the investigations reported in this bulletin, upon addition of boron a part of it was fixed by the soil and a part remained in the soil solution. The results indicated that anion exchange, molecular adsorption, and chemical precipitation may all take place in soils, but it has not been possible to designate which one to the exclusion of the others is operative in any given case. When boron was added to four test soils in amounts sufficient to produce initial soil-solution concentrations of 10 p. p. m., from 25 to 58 percent of it was fixed. At solution concentrations of from 1,000 to 3,000 p. p. m. the order of the four soils was the same, but only from 5 to 15 percent of the boron added was removed from solution. Equilibrium conditions between the soil and solution were attained slowly. As much as 15 percent more boron was fixed in a 300-day period than in a 30-day period.

Decreasing the pH value of 1-to-1 suspensions of four soils from 9 to 5.5 increased the concentration of boron in solution from twofold to fivefold. Below pH 5.5 the solubility of boron in two of the soils was further increased and in two of them it was decreased. The effect on boron solubility of increasing H-ion concentration in the soils by hydrochloric acid and carbon dioxide over the range 8 to 6 was found to be the same. The solubility of adsorbed boron was found to be a function of the H-ion concentration or of a variable to which such concentration provides an index.

**Analyses of commercial fertilizers, manures, and agricultural lime, 1939**, C. S. CATHCART (*New Jersey Stas. Bul. 674 (1939), pp. 41*).—The usual analytical data are accompanied by related information concerning the nature and quantity of the fertilizers offered for sale in New Jersey during 1939.

## AGRICULTURAL BOTANY

**Observations on the development of certain cell-wall constituents of forage plants**, E. BENNETT. (Mass. Expt. Sta.). (*Plant Physiol., 15 (1940), No. 2, pp. 327–334, figs. 2*).—In a study of Kentucky bluegrass and red clover at successive growth stages it was found that the percentages of ash and total N in general decreased throughout the season. The pectin in both remained relatively constant during the growth periods, the percentage in the grass being similar to wood or straw and in clover to leaves. The hemicelluloses increased in both plants as the season advanced, the percentage in the mature grass being ±25 times greater than that of pectin, while in the clover it was sometimes less than that of pectin and never more than twice as great. Lignin in both species increased as the plants grew older, the maximum percentage being about the same in both. There was no direct evidence for a relationship among pectin, hemicelluloses, and lignin, the results rather suggesting that their different proportions may be attributed to a difference in cell structure. There are 20 references.

**Factors affecting regeneration of the horseradish root,** R. C. Lindner (*Plant Physiol., 15 (1940), No. 2, pp. 161–181, figs. 12*).—Using over 15,000 small isolated test pieces of root by a method described, it was found that the various root tissues appear to possess different capacities for influencing regeneration processes. Root and bud initiation are confined to the lateral root traces, their outer tissues apparently being responsible for root initiation and both outer and inner tissues for maximum bud initiation. The factor (or factors) in the inner tissues stimulatory for bud initiation moves only along the root trace and requires intact cells for transfer. The dormant root does not possess a polar distribution of either root or bud initiation factors, polarity in root initiation being established only under a favorable environment for regeneration. An apparent polarity in bud initiation is established at the same time. Temperature variations have more effect on bud than on root initiation, and temperature produces its greatest effect at the time the meristematic regions are organizing into buds and roots. The pH of the medium has little effect on bud or root initiation. Naphthaleneacetic acid inhibited bud initiation and stimulated root initiation, but indoleacetic acid was not very effective, presumably because it was inactivated. Relatively high concentrations of these substances induced root initiation from isolated pieces of any living tissue of the root. Numerous organic and inorganic compounds and other "active" substances had little effect on either root or bud initiation. Tests with extracts of various parts of the root indicated that one of the factors in the inner tissues stimulatory for bud initiation is a chemical entity. There are 24 references.

**Stem morphogenesis in Lycopersicum: A quantitative study of cell size and number in the tomato,** H. B. Houghtaling (*Bul. Torrey Bot. Club, 67 (1940), No. 1, pp. 33–55, pl. 1, figs. 10*).—The author reports detailed studies of the development of the stem in three varieties of *L. esculentum* and one of *L. pimpinellifolium*, in two hybrids between these species, and in one $F_2$ grown from one of the hybrids. The anatomical pattern was found to possess a regularity with relatively slight deviations, which suggest a generic rather than a specific mechanism of control. Though minor deviations are under control of genetic factorial combinations characteristic of the several varieties and species (for *L. pimpinellifolium* has been held to differ specifically from *L. esculentum*), "it is evident that for the genus *Lycopersicum* the mechanism involved is the same in all types."

**Cytological studies of Lilium tigrinum,** J. J. Westfall (*Bot. Gaz., 101 (1940), No. 3, pp. 550–581, figs. 69*).—The development of the megagametophyte in *L. tigrinum splendens* was found to follow the general plan that has been reported for other members of the genus and for *Fritillaria* and *Tulipa*. Details of the study and historical discussion of the subject (45 references) are given.

**Amitosis,** J. McA. Kater (*Bot. Rev., 6 (1940), No. 4, pp. 164–180*).—A critical review (30 references) of the general problem involved, amitosis as a nonreproductive physiological process, in the ciliate macronucleus, as a reproductive phenomenon, and Stough's analysis of amitosis. "Though the data do not permit a definite conclusion, this reviewer doubts that amitosis will prove to be a method of cell reproduction."

**Spiral systems in the organization of living material,** W. D. Francis (*Plant Physiol., 15 (1940), No. 2, pp. 301–309, figs. 5*).—From a review of the literature (15 references) and photomicrographic work by the author, it is suggested that spirals of ascending and descending order may be the primordial structural basis for the coordination of functions in living systems. Integration or the harmonious functioning of the organism as a unit may therefore depend on protoplasmic spiral systems as the loci of electric potentials and the seat of electromagnetic fields.

**Dormancy and germination in seeds of Echinocystis lobata,** H. A. Choate (*Amer. Jour. Bot., 27 (1940), No. 3, pp. 156–160*).—Seeds of mock cucumber (*E. lobata*) are dormant when shed, this condition persisting under ordinary storage. Dormancy was found to be due to conditions within the embryo which prevented germination and made after-ripening necessary. This process can be induced by stratification at 5°–10° C., up to 95–100 percent germination having been obtained in this way. The time required for successful afterripening in the material tested varied from 2 weeks to 6 mo. Older seeds appeared to afterripen more quickly than freshly gathered ones, but it is believed that some factor other than age may play a role in accelerating the process.

**Root resistance as a cause of decreased water absorption by plants at low temperatures,** P. J. Kramer (*Plant Physiol., 15 (1940), No. 1, pp. 63–79, figs. 5*).—At constant pressure at 0°–40° C. the rate of water movement through tomato and sunflower root systems decreased with lowering of temperature for plants either in soil or water. The exudation rate from root systems not attached to a vacuum pump was highest at 25°, decreasing with both increased and decreased temperature. The rate of water movement through dead sunflower roots attached to a vacuum pump also decreased with lowering temperature but not to the same extent as in living roots. It is believed that this decreased rate for dead roots at low temperatures is due largely to the increased viscosity of the water. In living roots the added effects of decreased permeability causes an even greater resistance to water movement. The resistance for living sunflower roots was apparently 4 to 5 times as great near freezing as at 25°, while at 40° the resistance was only a little over half that at 25°. The principal cause of decreased water absorption at low temperatures apparently lies in the combined effects of decreased permeability of the root membranes and increased viscosity of water, resulting in increased resistance to water movement across the living root cells. The effects of low temperatures in decreasing root extension and respiration, active absorption, and root pressure phenomena are deemed to be of secondary importance. The increase in root resistance with lowering temperature is probably effective, however, in slowing up physiological (active) absorption of water, and possibly the absorption of solutes by roots.

**Aeration and plant growth in wet soils,** V. M. Conway (*Bot. Rev., 6 (1940), No. 4, pp. 149–163*).—A critical review of "the subtle relationships between plant and environment in these 'amphibious' habitats," with 17 references.

**Studies upon the time of flowering of plants: Anatomical, floristic and phenological aspects of the problem,** J. Grainger (*Ann. Appl. Biol., 26 (1939), No. 4, pp. 684–704, figs. 9*).—The growing points of over 100 species of diverse habit were examined to find the exact time of flower initiation, and types of organization are classified into direct-, indirect-, cumulative-, and climax-flowering plants. Abnormal flowering of some indirect-flowering plants suggested that their physiological rest periods are concluded in the fall, their normal extension of dormancy until spring probably being a direct effect of winter climate. Habit as annual, biennial, and perennial did not seem to affect the time of flowering unless associated with a store of food, but not all plants with stored food flower early. Correlation diagrams of temperature and flowering time suggested that temperatures before initiation of flower bud formation, in addition to those at other periods of floral development, may affect the time of flowering, some species apparently being hastened by higher than normal temperatures at this period. Flower emergence in 18 wild plants was hastened by temperatures higher than the normal climate for a period just before time of opening.

**Seasonal variations in the production of plant pigments,** W. A. Beck and R. Redman (*Plant Physiol., 15 (1940), No. 1, pp. 81–94, figs. 4*).—Using Dutch sweetclover as the test plant, the factors responsible for the regular variations found in chlorophyll, xanthophyll, and carotene may have exercised their influence directly or more probably by affecting the organization of the protoplasm, but the general trend was the same for all three pigments. The close relations between variations in green weight and amount of pigment suggested that both depended on the protoplasmic organization. The pigments all showed a primary peak in yields during spring and a secondary one in the fall, and there were corresponding lows in winter and summer. The times of peak and low were about the same for xanthophyll and carotene, but the time of peak for the carotinoids preceded that for chlorophyll. The last reached its primary peak in early May and its secondary peak in September, while its corresponding lows were in early March and early July. The amount of chlorophyll was always greater than that of carotenoid. In all cases the variations occurred in a remarkably regular manner, suggesting a relationship of the pigments in functions if not in origin. The vigorous development of the carotenoids immediately before the growing season agrees with the idea that they act as growth promoters. Light and temperature were evidently the factors most influential in pigment production, while soil moisture played a minor role. There were evident optima of light intensity and temperature. Before these were reached pigment production increased with light and temperature, but beyond these optima it was greatly reduced. These optima were about the same as the corresponding optima for metabolic activity, suggesting that to obtain maximum activity and yield under controlled conditions the control of light and temperature is as important in summer as in winter. There are 33 references.

**Relation between quantity of chlorophyll and capacity for photosynthesis,** R. Emerson, L. Green, and J. L. Webb (*Plant Physiol., 15 (1940), No. 2, pp. 311–317, fig. 1*).—"During photosynthesis in flashing light under optimum external conditions, the ratio of moles of chlorophyll present to moles of carbon dioxide reduced per flash is not a constant in *Chlorella pyrenoidosa* cells but depends on conditions of previous growth, increasing sharply with age of culture and varying with color and intensity of culture illumination. Thus the maximum amount of carbon dioxide reducible per flash is not directly related to the amount of chlorophyll but depends on some other internal factor."

**Light-mass absorption during photosynthesis,** E. A. Spessard (*Plant Physiol., 15 (1940), No. 1, pp. 109–120, figs. 5*).—Data are presented to indicate that green plants gain in weight (light-mass absorption) while insulated from their material environment, together with evidence relative to error, to surface phenomena due to atmospheric conditions during weighing operations, and to the question of $CO_2$ leakage through glass containers as possible explanations of the weight data.

**Effect of light intensity on the development of the photosynthetic mechanism,** M. C. Sargent (*Plant Physiol., 15 (1940), No. 2, pp. 275–290, figs. 3*).—Cultivated under intense illumination the unicellular green alga *Chlorella pyrenoidosa* had a low chlorophyll content, whereas under moderately low illumination the content was high but there was a low capacity for the Blackman reaction. The proportional effects of $CO_2$ concentration and cyanide were the same under both conditions. The photosynthetic quotient in both sun and shade plants was equal to —1 and the respiratory quotient was absolutely larger, especially in shade cells. The average cell size of sun and shade plants was very nearly identical. The growth rate of cultures was approximately proportional to the light intensity. As the population density of the culture increased the cell size

underwent internal changes, the average size becoming larger, the chlorophyll content (in sun cells) increasing, and the capacity for the Blackman reaction decreasing. There are 20 references.

**Experiments on photoperiod in relation to the vegetative growth of plants,** J. Bonner (*Plant. Physiol., 15 (1940), No. 2, pp. 319–325*).—*Xanthium, Brassica alba, B. nigra, Cosmos,* and *Lycopersicum* plants all contained more vitamin $B_1$ when grown under 18-hr. than under 9-hr. photoperiods. *Xanthium* and *Brassica* responded to additions of vitamin $B_1$ more strikingly under short than under long photoperiod. It is thus suggested that the effect of photoperiod on the vegetative growth of plants may be mediated by the effect of photoperiod on the production, not only of this vitamin, but also on that of other growth factors.

**Klinostat-studies in twining plants,** H. V. Hendricks (*Amer. Jour. Bot., 27 (1940), No. 3, pp. 195–198, figs. 2*).—"The morning-glory and to a less extent the hop and the black bindweed were studied when rotated on the klinostat with its axis at various angles of inclination. It was found that with this axis inclined not more than 75° from the vertical practically all stems twined. With further increase in this angle there was a gradual decrease in the number that twined, and with the axis horizontal twining rarely occurred. In general, the twinings were most marked within 75°. Apparently as a passive phenomenon a suggestion of reverse twining was occasionally seen with weak stems. Torsion of the stem while on the klinostat was found to increase in rate with growth of the internode, as described previously by the writer when the stem was held vertical. The duration of each experiment was not more than 48 hr., and the klinostats were not strictly uniform in their motion. On the other hand, some other investigators using very regular machines and with experiments of longer duration have obtained more cases of twining on the horizontal klinostat."

**Sexual hormones in Achyla.—II, Distance reactions, conclusive evidence for a hormonal coordinating mechanism,** J. R. Raper (*Amer. Jour. Bot., 27 (1940), No. 3, pp. 162–173, figs. 14*).—While the evidence previously presented (E. S. R., 82, p. 315) points to a coordinating mechanism of diffusible specific substances, the final proof of such a system is believed to depend on the demonstration of distance reactions. Such "telemorphotic" reactions involving both male and female plants are here presented as conclusive evidence of hormonal activity in initiating and coordinating the several stages of the sexual process in *A. ambisexualis.* The detailed results of the study are given, and the discussion includes the probable role of hormones in the sexual process of homothallic water molds, the restricted activity of hormones in nature, and a comparison of the mechanism in *Achyla* with those described in other members of the thallophytes.

**The response of seeds and seedlings to treatment with indolylacetic acid,** Y. Hwang and H. L. Pearse (*Ann. Bot. [London], n. ser., 4 (1940), No. 13, pp. 31–37, pls. 2*).—Treatment of oats and broad bean seeds with dilute indolylacetic acid solutions for 24 hr. before planting failed to increase the dry weight of the seedlings, and higher concentrations retarded growth. The rate of regeneration of lateral buds and shoots of decapitated oats seedlings growing in sand or soil cultures was increased by adding dilute solutions of the acid to the cultures, both length and dry weight of the regenerating buds being increased. This response was influenced by the length of the shoot remaining on the seedlings. Nitrogen-deficient plants exhibited no such response to the treatment. The bearing of these results on bud inhibition is discussed.

**Auxin in marine algae,** J. Van Overbeek (*Plant Physiol., 15 (1940), No. 2, pp. 291–299, fig. 1*).—In the brown alga *Macrocystis* and the green alga *Bryopsis,* auxin concentrations of the same order of magnitude as in the higher plants,

such as corn and pea seedlings, were found. The auxin in *Macrocystis* was shown to be indoleacetic acid or a substance closely related to it.

**Effect of naphthalene acetic acid and naphthalene acetamide on nitrogenous and carbohydrate constituents of bean plants,** J. W. MITCHELL (U. S. D. A.). (*Bot. Gaz., 101 (1940), No. 3, pp. 688–699, figs. 2*).—Application of α-naphthaleneacetamide and α-naphthaleneacetic acid to the stems of bean seedlings affected the total amount and distribution of carbohydrate and nitrogenous compounds in various parts of the plants and also in the plant as a whole. Some of the chemical responses were specifically associated with the acetamide and others with the acid treatment. In general, the chemical responses were closely associated with the growth responses. Tumors, made up largely of meristematic cells, developed in parts of stems to which the acid had been applied, and analyses indicated them to contain a relatively high percentage of nitrogen in the form of water-soluble compounds. Increased cambial activity and a relatively large amount of secondary thickening resulted in the stem regions treated with the acetamide, this part containing only slightly more N than control parts and a relatively small portion of the N present being in water-soluble forms. Plants treated with either substance were lower in starch, dextrin, and sugar in the roots, hypocotyls, and first internodes than were the controls. The presence of a limited amount of readily available carbohydrate in these parts of treated plants was associated with the development of a relatively small amount of leaf surface and with an inhibited transport of carbohydrate from the leaves. Growth responses in the stems were characterized by intensive cambial and meristematic activity and the initiation of roots within the hypocotyls. These effects on carbohydrate metabolism and transport finally resulted in a deficiency in the amount available in those parts where growth was stimulated for a time after treatment. There was no evidence of N deficiency, since its content in all parts of plants treated with the acid or acetamide was equal to or greater than that in control plants.

**The effect of cyanide on the respiration of barley,** W. O. JAMES and F. B. HORA (*Ann. Bot. [London], n. ser., 4 (1940), No. 13, pp. 107–118, figs. 9*).—The oxygen uptake of barley leaves was reversibly but not completely inhibited by M/500 HCN, and increasing concentrations had more marked effects. In the leaves $CO_2$ emission was reduced less than the $O_2$ absorption and the respiratory quotient rose. Withholding $O_2$ from leaves failed to alter the rate of emission of $CO_2$ before the period of the "respiration hump," probably implying a more rapid break-down of carbohydrate in N than in air. M/500 HCN did not affect the $CO_2$ output in N at the same period. Absence of $O_2$ retarded $CO_2$ at a later stage when proteins were the principal respiratory substrate. Lack of $O_2$ or presence of HCN delayed or prevented yellowing and evolution of $NH_3$, and it is presumed that proteolysis was correspondingly prevented. Germination of excised embryos was inhibited by M/200 HCN or by absence of $O_2$, and small doses of $H_2S$ inhibited germination of soaked grains. The embryonic output of $CO_2$ was brought to a standstill in N at 24 hr. and was also reduced by HCN in the leaves. The R. Q. fell in spite of a measure of $O_2$ inhibition. The results are believed to suggest that an oxidation mechanism taking part in barley respiration is sensitive to dilute HCN. Glycolysis is probably not directly affected, but the break-down of proteins in N is so affected.

**Hydrogen-ion effects and the accumulation of salt by barley roots as influenced by metabolism,** D. R. HOAGLAND and T. C. BROYER (Univ. Calif.). (*Amer. Jour. Bot., 27 (1940), No. 3, pp. 173–185, figs. 7*).—In this study "the selective absorption of ions and changes of reaction in the culture solution were found to depend on the metabolism of the roots and their initial salt content

as well as on the nature of the salt. Marked regulatory changes in the sap buffer system, metabolically induced, occurred as a result of unbalanced cation-anion accumulation, with a general tendency toward maintenance of the pH value of the expressed sap within a relatively narrow range. The organic acids were especially concerned with these adjustments. The effects of pH of buffered and unbuffered culture solutions on the accumulation of salt were studied. No evidence was disclosed that accumulation of salt is fundamentally dependent on mechanisms of H ion or [K] [OH] gradients between the vacuole and the external medium."

**Metabolic processes of potato discs under conditions conducive to salt accumulation,** F. C. Steward and G. Preston (*Plant Physiol., 15 (1940), No. 1, pp. 23–61, figs. 9*).—Variability in composition of replicate batches of 40–60 standard potato discs, cut from a uniform tuber stock and washed 24 hr. in running tap water, proved to be negligible relative to metabolic changes during periods of the order of 72 hr. under conditions conducive to salt absorption (40–60 discs in 2 liters of aerated solution at 23° C.). Results were calculated on the initial fresh weight of a known number of standard discs of known weight, and the application of conductivity methods to the determination of absorbed $CO_2$ and other methods used are described. In relatively strong KCl the tissue approached a steady respiratory rate at a level far exceeding that of tissue in distilled water, and, conversely, in $CaCl_2$ of the same equivalent strength the steady level was much lower than for distilled water. The contrast in the effects of K and Ca salts is one appearing in many aspects of the metabolic behavior of the tissue. The discs decreased in calorific value by amounts much exceeding expectations on the basis of their respiration. Discs in aerated distilled water or K salt solutions synthesized protein, this being greater in relatively strong K salts than in water and being suppressed in relatively strong Ca solutions. The nitrogen for synthesis was drawn from the soluble N fraction. This fraction in dormant tubers consisted of both amides and amino compounds, with negligible amounts of free $NH_3$. The fractions determined and discussed accounted quantitatively for the soluble N of the tissue.

During protein synthesis N was drawn from both the stable amide and the amino N fractions. The bulk of the N converted to protein was derived from amino compounds other than asparagine, and salts influenced both the total protein synthesis and the utilization of the amino acids, etc. The relative utilization of amino acids was increased by K and decreased by Ca salts. Under active metabolism and protein synthesis the unstable, glutaminelike amide increased in the tissue. It apparently is a reactive intermediary whose subsequent utilization is accelerated by salt conditions stimulating synthesis. These metabolic processes are reflected in changes in the buffer system of potato, and methods suitable for rapid electrometric titration of the sap are described and were used. The KCl and oxygen treatments stimulating respiration of the discs also increased the superficial browning due to oxidation of phenolic compounds by aerobic oxidase, and the converse effect occurred on substitution of $CaCl_2$. The bulk of the reducing action of potato extracts was due to ascorbic acid. Its content in the discs did not appear to be a causal agent in the respiration or browning reaction of living cells. It is concluded that the outstanding metabolic processes under the conditions conducive to salt accumulation are those conditioned by $O_2$ and the nature of the salts supplied, and these are mutually interrelated. Of these the synthesis of protein, utilization of amino acids and stable amides, formation of unstable amides, use of organic acid radicals, and the oxidation phenomenon shown by the browning reaction are

all linked with the rate of aerobic respiration and must contribute to the metabolic mechanism rendering salt accumulation possible.

There are 45 references.

**Metabolism of nicotine monohydrochloride in excised tobacco shoots,** R. F. DAWSON (*Amer. Jour. Bot., 27 (1940), No. 3, pp. 190–194*).—In all the culture solutions about three-fourths of the absorbed nicotine was recovered as such from the tissues after 96 hours' culture. The remainder was not recovered from the Turkish variety, the tissues of which were prepared for analysis by drying at 80° C., but when the Rosenberg variety was used and the leaves were prepared by cold water extraction the remaining one-fourth was located quantitatively in the undetermined N fraction. The evidence suggested that at least a part of the lost N may have escaped from the tissues during drying. About four-fifths of the transformed nicotine N was located in the leaf tissues, thus indicating the superior ability of the leaves to metabolize nicotine. The rate of nicotine change decreased from the first to the last day of culture at a rather constant rate, while the rate of nicotine accumulation increased from the first to the third day and decreased on the fourth. Present data appear to indicate that the substances into which nicotine may have been converted are water-soluble and volatile. They may be too weakly basic to be retained in the leaves of Turkish tobacco, whereas in the Rosenberg variety they may be sufficiently basic to be retained in the cell sap, but if volatile may not be basic enough to be titrated with 0.02 N HCl to methyl red. Neither nicotine nor its conversion products were utilized as a N source in the cases where significant protein synthesis occurred, hence the alkaloid nicotine apparently cannot serve as a N source in the protein economy of tobacco. The effects of nicotine monohydrochloride on the nitrogenous composition of tobacco leaves and stalks were not pronounced.

**Does "C. P. grade" sucrose contain impurities significant for the nutrition of excised tomato roots?** P. R. WHITE (*Plant Physiol., 15 (1940), No. 2, pp. 349–354, figs. 2*).—From the review (18 references) and experimental study reported, it is concluded that the best evidence at present available fails to indicate the presence in C. P. grade sucrose of impurities necessary for, or clearly beneficial to, the growth of excised tomato roots.

**Sucrose vs. dextrose as carbohydrate source for excised tomato roots,** P. R. WHITE (*Plant Physiol., 15 (1940), No. 2, pp. 355–358*).—Under the experimental conditions used as standard in the author's laboratory for the past 6 yr., sucrose is said to have proved superior to dextrose as a carbohydrate source for excised tomato roots.

**The absorption of carbon dioxide by unilluminated leaves,** J. H. C. SMITH (*Plant Physiol., 15 (1940), No. 2, pp. 183–224, figs. 11*).—Measurements by methods described of the $CO_2$ absorption by unilluminated leaves indicated that all species examined (except possibly *Sedum praealtum*, an acid plant) absorb $CO_2$ in excess of that ascribable to the water they contain. Since etiolated yellow and albino leaves exhibited as great an absorption as the chlorophyllous, it seems that chlorophyll is not a controlling factor here. This was confirmed by the fact that extracted leaf residues still containing chlorophyll gave no evidence of compound formation with $CO_2$. Chlorophyll and pheophytin both absorb $CO_2$ but exhibit no indication of chemical combination with it. It was shown that the $CO_2$ absorption process is strictly reversible in either killed or living leaves. Water in the leaves absorbs $CO_2$ in proportion to the amount present and to the partial pressure of the $CO_2$. Detailed analysis in sunflower leaves revealed that both the sap and the insoluble leaf residue

absorb $CO_2$. Absorption in the sap may be accounted for by the reaction of carbonic acid with the buffers present, chiefly with the phosphates, while that by the insoluble material is attributable to the alkaline-earth carbonates therein. There are 33 references.

**Distribution of nitrogenous and carbohydrate fractions and other substances in exposed and covered pineapple sister shoots,** C. P. Sideris, B. H. Krauss, and H. Y. Young. (Hawaii. Pineapple Prod. Expt. Sta.). (*Plant Physiol., 15 (1940), No. 2, pp. 225–255, figs. 9*).—Using 40 pairs of sister shoots, 1 pair for each mother plant, the weights of the covered shoots were less at the end of the 77- and 105-day periods than for those of the light-exposed shoots, indicating retardation but not necessarily full cessation of growth. The moisture content of the various sections of leaves and stem was greater for covered than for exposed shoots, showing that the total solids per unit of fresh tissues were greater for the latter. There was a breaking down of chlorophyll in the leaves of covered shoots developed before covering, and chlorophyll failed to form in those produced afterward. The electrical resistance of the extracted sap was greater for the covered shoots, indicating a greater content of electrolyte solutes in the sap of the exposed shoots. Titratable acidity was greater in the chlorophyllous sections of the exposed shoots, while in the nonchlorophyllous sections these values were higher for the covered shoots. This indicates that the titratable acidity content of the chlorophyllous sections of covered shoots did not increase while covered but decreased instead, probably due to inadequate carbohydrate supply. The lower organic acid content of chlorophyllous sections of covered shoots was attributed to decarboxylation and utilization of the byproducts by the protoplasm. Production of organic acids in chlorophyllous sections of leaves appeared to be associated directly or indirectly with photosynthesis, and in nonchlorophyllous tissues of stems and leaves it was of respiratory type. Nitrate N was more abundant in the nonchlorophyllous sections of leaves and in the stem of exposed shoots, indicating a higher rate of absorption than in the covered shoots. Total organic N was generally greater in the exposed shoots. The relative rate of nitrate assimilation decreased considerably in the chlorophyllous sections of leaves on covered shoots, which may account for the lower organic N in these shoots. No outstanding difference was noted in amounts of reducing sugars in exposed v. covered shoots, but sucrose occurred in larger amounts in the former. Calcium occurred in larger quantities in leaf and stem sections of exposed shoots and in the pith of the apical section of the stem than in any other section.

The data in general are believed to indicate that sister shoots receiving a great amount of their organic nutrition and water by way of the roots and stem of the mother plant differ considerably in their physiological behavior and chemistry when one is in the light and the other in darkness. There are 35 references.

**Biochemical nitrogen fixation studies, I, II,** F. E. Allison, C. A. Ludwig, S. R. Hoover, and F. W. Minor. (U. S. D. A.). (*Bot. Gaz., 101 (1940), No. 3, 513–533, 534–549, figs. 8*).—Two papers are presented.

I. *Evidence for limited oxygen supply within the nodule.*—The plants used to the greatest extent in these studies of legume nodules included cowpea, crown vetch, Korean lespedeza, hairy vetch, common vetch, soybean, crotalaria, and sweetclover. Using standard manometric procedures, the respiration rates of detached nodules in various oxygen-nitrogen mixtures increased with the $O_2$ percentage, the $Q_{O_2}$ values varying between 0.62 and 6.25 (average ±2.2) in air and being ±2.4 times as great in pure $O_2$, with maxima for

the eight species varying between 4.3 for soybean and 8.9 for hairy vetch. The respiratory quotients increased with size of nodule and with decrease in $O_2$ concentration. In air the values were 1-2, depending largely on nodule size, while in pure $O_2$ (excluding very large nodules) the values averaged 1.03. Glucose in the nutrient medium produced a mean increase in $Q_{O_2}$ of ±12 percent in air and 14 percent in pure $O_2$. It increased the R. Q. at the lower concentration of $O_2$ but not appreciably in pure $O_2$. The results are believed to indicate that with most detached nodules maintained in air, or with large nodules at $O_2$ concentrations as high as 100 percent, the interior is under anaerobic conditions and that under natural conditions in the soil the $O_2$ supply inside most nodules is also limited. The nodules of all species tested showed rather similar responses, the variations among species being not much greater than that within a single species.

II. *Comparative respiration of nodules and roots, including non-legume roots.*—The respiration rates of nodules and small legume and nonlegume roots in a nutrient solution in air averaged nearly the same, and that of the roots of various species showed no marked differences for roots of comparable age, size, and condition. The R. Q. of small legume and nonlegume roots maintained in air was definitely lower than for nodules. The respiration rates per unit of dry matter in legume nodules in pure $O_2$ were more than twice as large as in air, whereas values for small legume and nonlegume roots were usually not markedly affected by additional $O_2$. It is thus concluded that nodules have an inherent capacity for respiring more rapidly than root tissues, provided the inner cells can obtain the necessary $O_2$. Small legume and nonlegume roots were more deficient in available energy than the nodules. Respiration rates per unit of N in legume and nonlegume roots maintained in air were 3-4 times as great as for nodules, and even in pure $O_2$ the $Q_{O_2}$ (N) values of roots averaged about twice as great as for nodules. These data are believed to be in harmony with the idea frequently suggested by morphological studies that the nodule consists of plant cells largely filled with comparatively inactive bacteria. The bacteria apparently oxodize only a very small part of the total carbohydrate photosynthesized by the host plant.

**The mycorrhizal relations of larch.—I, A study of Boletus elegans Schum. in pure culture,** J. E. How (*Ann. Bot.* [*London*], *n. ser.*, *4* (*1940*), *No. 13*, *pp. 135–150, figs. 16*).—The regular occurrence of many soil hyphomycetes in the vicinity of certain tree species is well known, and by far the most constant of these associations recorded for *Boletus* is that between *B. elegans* and larch, the mycorhizal basis of which has been established. This study was initiated in the hope of elucidating fungus physiology and the role of mycorhizas in trees. No evidence was found that the mycelium of *B. elegans* differs in any important respect from that of other species of the genus. Growth was adversely affected by concentrations greater than ±0.2 M. In pure culture the fungus used starch, sugars, and pectin but not cellulose or lignin. While nitrate, asparagine, peptone, and gelatin can serve as N sources, optimum growth was obtained only on inorganic $NH_4$ salts. The maximum pH range on media containing glucose, salts, and inorganic N compounds was 3.0–3.2 to 6.4. It is concluded that the method of pure culture is of limited value for studying a soil fungus such as *B. elegans.*

**Mathematics in bacteriology,** O. Rahn (*Minneapolis, Minn.: Burgess Pub. Co.,* [*1939*], *pp.* [*1*]+*III*+ *63, figs. 12*).—The object of this book, the result of a series of lectures, is to aid the student in acquiring an understanding of the quantitative interrelationships of the various life functions of bacteria by solving problems. The text deals with the expression of mathematical formulas in

curves, unrestricted cell division, growth of individual organisms, unrestricted fermentation, restricted multiplication, restricted fermentation, disinfection, statistics in bacteriology, and the use of graphs.

**Taxonomic contributions**, L. Benson. (Univ. Ariz.). (*Amer. Jour. Bot.*, *27 (1940) No. 3, pp. 186–190, figs. 2*).—This taxonomic paper includes the native paloverdes of Arizona, new combinations in *Ranunculus* for the State, a new collection of *R. oresterus*, the name of the burroweed (*Aplopappus tenuisectus* n. comb.), the status of *Arctostaphylos elegans*, and the habit of the Alvord oak (*Quercus alvordiana*).

**New or little known species of Poria**, L. O. Overholts. (Pa. Expt. Sta.). (*Pa. Acad. Sci. Proc.*, *13 (1939), pp. 121–125, figs. 6*).—The species here covered (including new taxonomy) "represent a few of the accumulations over a period of years in the writer's herbarium."

**Paleoecology of two peat bogs in southwestern British Columbia**, H. P. Hansen. (Oreg. State Col.). (*Amer. Jour. Bot.*, *27 (1940), No. 3, pp. 144–149, figs. 3*).—"Pollen analyses of two post-Vashon bogs in southwestern British Columbia show that the pioneer postglacial forests consisted largely of lodgepole pine, suggesting an initial cool and damp period. This was followed by a spruce-pine forest with a predominance of spruce, indicating an increase in moisture and temperature. A third period of decreasing moisture and temperature is marked by the increase and dominance of Douglas fir and hemlock, which has existed to the present. The method of formation of Lulu Island, its physiographic and edaphic instability, its position in relation to winds and adjacent forests, and plant succession on the island and bog are responsible for an inaccurate representation of nearby forests by their pollen as preserved in the peat. The Westminster bog, however, probably records a fairly accurate representation of adjacent forests. Climatic interpretations are tentative but essentially agree with those of pollen analyses of other bogs in the Pacific Northwest."

**Plant material introduced by the Division of Plant Exploration and Introduction, Bureau of Plant Industry, July 1 to December 31, 1935** (*U. S. Dept. Agr., Inventories 124 (1940), pp. 22; 125 (1940), pp. 35*).—No. 124 lists 449 lots of plant material introduced from July 1 to September 30, and No. 125 lists 1,206 lots introduced from October 1 to December 31, 1935. Descriptive notes are given in many cases.

## GENETICS

**The genetic front in the U. S. S. R.**, J. W. Pincus (*Jour. Hered.*, *31 (1940), No. 4, pp. 165–168*).—A very brief summarization is given of the pro and con discussion of Mendelism and Darwinism which has been current in the Soviet Union since about 1937 and which has been presented especially in *Yarovizatsia*, edited by T. D. Lyssenko and I. I. Prezent. Attacks on Mendelism through Darwinism were especially prevalent.

**Towards the advancement of Soviet genetics**, M. Mitin (*Amer. Quart. Soviet Union*, *2 (1940), No. 4, pp. 37–48*).—A discussion of present views on genetics in the Soviet Union which gives special consideration to evolution, as contrasted with the unalterability of the genes and the resulting phenotypes.

**The genetics and chemistry of flower colour variation**, W. J. C. Lawrence and J. R. Price (*Biol. Rev. Cambridge Phil. Soc.*, *15 (1940), No. 1, pp 35–58, fig. 1*).—A comprehensive review with about two pages of references.

**Nuclear changes affecting growth**, D. F. Jones. (Conn. [New Haven] Expt. Sta.). (*Amer. Jour. Bot.*, *27 (1940), No. 3, pp. 149–155, figs. 15*).—"Up to the present time visible chromosomal irregularity has been considered to be the

result of abnormal growth and not the cause of it. By the use of favorable material, having suitable genetic markers in subepidermal tissue, it is easily observed that changes in cell size, shape, composition, and activity result from chromosome breaks and relocations. These changes in the chromosome pattern ordinarily cannot be observed in somatic cells, and in animal tissues that have no genetic markers this starting point for changes in cell activity has escaped detection. Evidence from somatic changes in single cells gives proof that the nucleus controls characters that are manifest only in the cytoplasm. Chromatin has the ability to propagate cell controlling substances indefinitely, and changes in nuclear organization should be expected to be the basis for persistent neoplasms that are capable of unlimited reproduction. Evidence is now at hand that relocation of chromosome parts results in alteration of growth, and that this relocation is induced both by inherited conditions and by external agents of many kinds."

**The relationship between the origin of selfed lines of corn and their value in hybrid combination,** S.-K. Wu. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron., 31 (1939), No. 2, pp. 131–140; abs. in Minnesota Sta. Rpt. 1939, p. 39*).—Single crosses between inbred lines of corn selected from certain crosses were compared for yield. The several groups include crosses between pairs of inbred lines with both parents in common, pairs of lines with one parent in common, unrelated pairs of lines, and top crosses with Minnesota No. 13, an open-pollinated variety.

Single crosses made from inbred lines selected from a single cross yielded, on the average, consistently lower than single crosses from inbred lines with one parent in common, or single crosses from inbred lines of diverse genetic origin. No significant difference was noted in yielding ability between single crosses from inbred lines with one parent in common and those from inbred lines of entirely different genetic origin.

Selection for certain characters by the pedigree method of breeding was effective in isolating inbred lines more desirable in these characters than either parent, especially in the selection for earliness. The inbred lines, in general, showed a combination of desirable characters from both parents.

**Recent linkage studies in maize, I–VI** (*Genetics, 24 (1939), No. 1, pp. 59–63*).—Six contributions are included.

I. *Virescent seedling–16* ($v_{16}$), H. K. Hayes and M. S. Chang (pp. 59, 60) (Minn. Expt. Sta.).—Virescent seedling, $v_{16}$, was placed in chromosome VIII on the basis of linkage relations with japonica and male-sterile-8, the order of the genes appearing to be $v_{16}$–$ms_8$–$j$.

II. *Zebra striped–6* ($zb_6$), H. K. Hayes and M. S. Chang (p. 60) (Minn. Sta.).—Zebra-striped, $zb_6$, obtained from an inbred line of sweet corn furnished by J. D. Barnard, was placed in linkage group 4, with the order of the genes appearing to be $su_1$–$zb_6$–$Tu$–$gl_3$ for sugary, zebra, tunicate, and glossy seedling, respectively.

III. *Zebra seedling–4* ($zb_4$), H. K. Hayes (pp. 60, 61) (Minn. Sta.).—Zebra seedling, $zb_4$, was located in chromosome I.

IV. *Ramosa ear–2* ($ra_2$), H. K. Hayes (p. 61) (Minn. Sta.).—The characteristics of a ramosa ear–2 ($ra_2$) received from [R. A.] Brink are mentioned.

V. *Opaque endosperm–2* ($o_2$), W. R. Singleton (p. 61) (Conn. [New Haven] Sta.).—Opaque endosperm–2, ($o_2$), recessive to floury, was located on chromosome VII, probably two or three units to the right of $v_5$.

VI. *White sheath–3* ($ws_3$), M. M. Rhoades (p. 62) (U. S. D. A.).—White sheath, $ws_3$, was located in chromosome II in the probable order $ws_3$–$lg_1$–$gl_2$.

**Crossing and selfing studies with physiologic races of oat stem rust,** T. Johnson and M. Newton (*Canad. Jour. Res., 18 (1940), No. 2, Sect. C, pp. 54–67, pl. 1, figs. 5*).—It was found that some physiologic races of oat stem rust, *Puccinia graminis avenae*, contain both homo- and heterozygous lines, the latter when selfed tending to produce races more virulent than the selfed race. In crosses between races the less virulent characters were usually dominant, the hydrid race often being identical with the less virulent of the two parents. It is thus indicated that the more virulent characters are recessive traits. Reciprocal crosses between physiologic races suggested that both cytoplasm and nucleus contribute to the inheritance of certain pathogenic characters. In crosses between races of normal (red) and orange uredial color the red invariably proved dominant, their progeny being indistinguishable from the normal parent. Two selfing studies of race 3, done with the same telial material at an interval of more than 4 yr., provided evidence of a genetic change, presumably induced through aging of the teliospores. In the first selfing no abnormalities were noted in the barberry infections, but in the second about half of the infections developed pycnia and pycnial nectar while the remainder appeared as small, round, necrotic areas showing no indication of even rudimentary pycnial formation.

**On the synthesis of cleavage chromosomes,** T. S. Painter (*Natl. Acad. Sci. Proc., 26 (1940), No. 2, pp. 95–100*).—Observations on the growth and chromosome formation in ova have shown various almost unbelievable phenomena. For example, in larval tissues of insects, growth is often accomplished by an increase in nuclear and cell size rather than by cell division. It is accompanied by a series of intranuclear chromosome cell divisions reaching a high degree of polyploidy, with as many as 2,048 complete sets of chromosomes in the salivary glands of *Gerris*. Similar situations in the early formation of ova, especially in *Drosophila*, regarding numbers and kinds of chromosomes are described.

**Chromosome complement in buffalo (B. bubalis L.),** G. M. Pkhakadze (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 24 (1939), No. 8, pp. 794, 795, fig. 1*).—Cytological studies were made of germinal tissue of testes from 2- to 3-year-old buffalo. Diploid chromosome counts of 60 from spermatogonia were reported. Several V-shaped chromosomes (4–6) were noted.

**Difference in blood value of Karakul sheep in correlation with their organic constitution,** E. P. Panfilova (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 23 (1939), No. 6, pp. 569–572*).—Study of the relation of hemoglobin content to body weight in Karakuls showed a correlation coefficient of $+0.375 \pm 0.13$. When grouped according to hemoglobin content, the dams were found to rank in the order of coarse, normal, and slender constitutional types. The body weight was greater for groups of dams having larger erythrocyte diameters, and the coefficient of correlation was $+0.284 \pm 0.153$. It is believed that the blood value may serve as an additional criterion for determining the constitution and evaluating breed qualities.

**Improvement of the Navajo sheep—a unique breed and the project to improve it as developed at the Southwestern Range and Sheep Breeding Laboratory,** C. T. Blunn. (U. S. D. A.). (*Jour. Hered., 31 (1940), No. 3, pp. 98–112, figs. 6*).—Description is given of Navajo sheep and the objectives and outline of the research program of the laboratory conducted by the U. S. Department of Interior Indian Service and the U. S. Department of Agriculture to improve the old-type Navajo sheep and synthesize a new breed by crossing them with other breeds. The breeding of the old-type Navajo sheep, which produced wool suitable for weaving, is encouraged on a part of the reservation.

**A cross of gene environment as a means of studying the inheritance of some quantitative characters in Mus musculus,** A. B. D. Fortuyn (*Genetica ['s Gravenhage], 21 (1939), No. 3–4, pp. 243–279, fig. 1*).—Study was made of the inheritance of quantitative characters in mice by crossing two strains possessing the same number of tail rings and tail vertebrae but differing in foot length. Determination was made of these characteristics in the first, second, and third generations of progeny in the reciprocal crossbreds and in the first and second generations thereafter. In the ♀ sex there was no difference between reciprocal crosses, but in the ♂ sex the maternal type was found to be dominant, pointing to the action of the sex chromosomes which must contain at least one gene involving foot length. The reciprocal crosses in the different sexes came to show differences in the numbers of tail vertebrae. In general, the work confirmed the idea regarding a Mendelian mode of inheritance of quantitative characters.

**The effect of specific genes on the size character tail ring number in Mus musculus,** L. W. Law (*Genetica ['s Gravenhage], 21 (1939), No. 1–2, pp. 1–15, fig. 1*).—Reciprocal crosses and backcrosses of three highly inbred strains and a wild race showed that dilute mice have a significantly greater tail ring number than their intense sibs. The greater tail ring number of the *d* gene seemed to out-weigh the contrary effect of the short ear (*se*) gene. A maternal effect was evidenced in that mothers with greater tail ring numbers produced offspring with larger tail ring numbers. Support of the theory that the *Y* chromosome carried size genes was lacking.

**Rex: A dominant autosomal monogenic coat texture character in the mouse,** F. A. E. Crew and C. Auerbach (*Jour. Genet., 38 (1939), Nos. 1–2 pp. 341–344, pl. 1*).—Although rex and karakul coats were similar characters in the house mouse, 190 backcross progeny from heterozygotes of the 2 stocks showed that the 2 characters were genetically distinct and were controlled by genes on separate chromosomes.

**A polydactylous strain of mice,** A. B. D. Fortuyn (*Genetica ['s Gravenhage], 21 (1939), No. 1–2 pp. 97–108*).—Polydactyly was found to occur in an inbred strain of mice to the extent of 12 percent in the ♂♂ and 18 percent in the ♀♀. In most cases, it involved only the first toe of the right hind foot. The abnormality is transmitted more often to daughters than to sons by abnormal fathers. *Polydactylous mice showed an excess of motor neurons in the* spinal cord on the same side as the abnormality occurred.

**A mutation from agouti with recessive spotting to dominant spotting in Mus musculus,** A. B. D. Fortuyn (*Genetica ['s Gravenhage], 21 (1939), No. 1–2, pp. 92–96, figs. 2*).—A black-eyed white ♂ was found to occur among the progeny of agouti-and-white mice. On breeding, the condition was found to be due to the mutation of a single gene, which was lethal when homozygous. Its relation to anemia in mice was not determined.

**Investigation of the prediction of the progeny performance in fowls by the production of the ancestors and relatives** [trans. title], H. F. Krallinger (*Arch. Geflügelk., 13 (1939), No. 7–8, pp. 221–253, fig. 1; Eng. abs., pp. 251, 252*).—An analysis of the production records in the progeny of 48 cocks for the first year demonstrated that family production records were preferred to the average production of ancestors alone, or ancestors and their relatives, as an indication of the genotype of the sire. Dominant genes seemed more important than the cumulative action of genes having quantitative effects.

**Brachydactyly in the fowl: Is it linked to leg feathering?** D. C. Warren. (Kans. Expt. Sta.). (*Jour. Hered., 31 (1940), No. 3, pp. 141–144, fig. 1*).—Examination of 1,388 brachydactylous ♀♀ showed that more than half were in

a class having the fourth toe equal to the second, whereas nearly half had the fourth toe slightly shorter. Birds with normal toes seldom showed tarsal feathering, and only a very small percentage of the birds showing brachydactyly were free of tarsal and foot feathering. Brachydactyly behaves as an incomplete dominant in that heterozygotes are distinguishable from homozygous dominants. The close relationship between these two characteristics suggests that they may be either different expressions of the same genes or that the genes are closely linked on the same chromosome. Notation was made that the degree of leg feathering varied inversely with the shortening of the fourth toe, indicating that the two conditions may be different expressions of the same gene. A hypothesis is also proposed that heavy leg feathering is due to two dominant factors, with one producing brachydactyly along with leg feathering.

**A comparison of methods of assay of the lactogenic hormone,** A. J. Bergman, J. Meites, and C. W. Turner. (Mo. Expt. Sta.). (*Endocrinology, 26 (1940), No. 4, pp. 716–722*).—Comparison by one rabbit and three pigeon assay methods of the potency of lactogenic extracts showed that, using the McShan-Turner method based on minimum stimulation of the crop gland of pigeons as a standard, the Reece-Turner pigeon method was about 22 times more sensitive and the minimum intradermal test method 177 times more sensitive. The Riddle-Bates test based on crop weight was 1.5 times as sensitive as the McShan-Turner method. The Lyons-Page intradermal test was the least sensitive of the pigeon crop-gland tests, but the Gardner-Turner rabbit test was the least sensitive of all. Essentially similar results were obtained in inducing lactation in the rabbit from lactogen assayed in rabbits and pigeons.

**The relative effects of progesterone and testosterone propionate upon ovipositor lengthening of the female bitterling,** I. S. Kleiner (*Endocrinology, 26 (1940), No. 3, pp. 534, 535*).—Progesterone in greater dilutions than testosterone propionate caused lengthening of the ovipositor of the ♀ bitterling, but the testosterone propionate was longer in action, being from 24 to 72 hr., as contrasted with from 6 to 8 hr. for the progesterone.

**Further studies on the purification of mare gonadotropic hormone,** H. Goss and H. H. Cole. (Univ. Calif.). (*Endocrinology, 26 (1940), No. 2, pp. 244–249*).—In further experiments (E. S. R., 70, p. 607; 76, p. 779) on the purification of the gonadotropic hormone of pregnant-mare serum, twofold purification could be obtained by redissolving the first 70-percent acetone precipitate in 50-percent acetone, and a very potent extract was removed between pH 5.5 and 4.5. It was completely destroyed at pH 6.0 with 60-percent acetone.

**Preparation of the gonadotropic hormone from the anterior pituitary of the sow,** C. A. Elden and M.-D. F. Nutting (*Endocrinology, 26 (1940), No. 3, pp. 526, 527*).—Information is given on the preparation of purified gonadotropic hormone from the anterior lobe of the sow's pituitary by precipitation with dioxane at pH 7.1 to 7.3.

**Induction of mating and ovulation in the cat with pregnancy urine and serum extracts,** W. F. Windle (*Endocrinology, 25 (1939), No. 3, pp. 365–371*).—Pregnant-mare-serum and pregnancy-urine extracts were effective in inducing oestrus, mating, and pregnancy in cats, but these responses were more readily accomplished from February to June than at other times. These substances were ineffective within from 2 to 5 weeks after previous treatment.

**Effect of a normal male urine extract on immature female cats,** W. F. Starkey and J. H. Leathem (*Endocrinology, 26 (1940), No. 3, pp. 499–502, figs. 6*).—Mature and immature ♀ cats injected with about 20 rat units per day of normal ♂ urine extract (prospermin) responded by increased ovarian weight. The response occurred in most of the cats, but failure to respond was associated with the condition of the ovary.

**The assay of progesterone by the production of an artificial pregnancy-response of the feline uterus,** H. B. Van Dyke and J. S. Chen (*Endocrinology, 25 (1939), No. 3, pp. 337–346, figs. 15*).—An assay technic for progesterone involving an artificial pregnancy response of the uterus in the cat is described. Preliminary sensitizing doses of oestrogen were given on 2 days, with one-third of the progesterone on each of the fourth, fifth, and sixth days. Positive results were based on the contraction of the uterus following intravenous injection of 2.5γ of adrenalin on the seventh day.

**The metabolism of the thyrotrophic and gonadotrophic hormones,** S. M. Seidlin (*Endocrinology, 26 (1940), No. 4, pp. 696–702*).—Removal of thyroids and gonads was found to cause an increased production of the corresponding "trophic" hormones in the urine of guinea pigs. It is suggested that the thyroid and gonads play an important part in the removal of these hormones.

**Pigment production in the guinea pig,** M. T. Harman and A. Alsop. (Kans. State Col.). (*Kans. Acad. Sci. Trans., 42 (1939), pp. 443, 444*).—In a study of the pigment in the skin and hair of fetal and adult guinea pigs of known genotype, no difference was noted between black, chocolate, and red pigment granules at fetal ages of from 43 to 44 days. Four types of granules—black, chocolate, red, and colorless—were noted in adults. Interaction between the genes concerned in the colors is described. Differences in the formation of granules of several colors are noted.

**The influence of testosterone propionate upon sexual differentiation in genetic female mice: Postnatal androgen alone and in combination with prenatal treatments,** C. D. Turner (*Jour. Expt. Zool., 83 (1940), No. 1, pp. 1–31, pls. 2, figs. 5*).—The administration of testosterone propionate to ♀ mice between the tenth and fourteenth days of gestation led to the differentiation of ♂ sex accessory glands in ♀ embryos but did not prevent proliferation of the secondary sex cords and the establishment of the ovarian cortex. Androgen administrated postnatally to ♀♀ caused hyperthrophy of the glans clitoridis and differentiation of erectile tissues but did not influence differentiation of a penial urethra. Prenatal treatment with testosterone propionate caused the formation in ♀♀ of the homologs of the ♂ secondary sex organs, such as prostate lobes, bulbo-urethral glands, etc., in most of the genetic ♀♀ treated. Postnatal administration of oestrogen inhibited ovarian function and induced differentiation of a conspicuous clitorislike elevation.

**The effects of an experimentally induced endocrine imbalance in female mice,** C. A. Pfeiffer (*Anat. Rec., 75 (1939), No. 4, pp. 465–491, pls. 3, fig. 1*).—Both testes from litter mates were grafted into the neck region of 30 newborn ♀♀ from 7 different strains. The animals were sacrificed after definite indications of hormone imbalance following changes in the cycle, and sections of the reproductive organs, related endocrines, and bone growth were studied. Within 20 days after the opening of the vagina, a predominantly oestrous condition or protracted dioestrous periods became evident. The presence of corpora lutea, although small, indicated that the follicles were capable of maturing. Ovaries were smaller, and mammary glands were stimulated in all animals exhibiting an altered endocrine balance. An enlarged hypophysis was noted and was considered responsible for a number of the changes.

**The mode of action of testosterone propionate on the female genital tracts,** J. W. Huffman and L. H. Bos (*Endocrinology, 26 (1940), No. 2, pp. 259–263, fig. 1*).—The rabbit ovary was found to be stimulated by extracts of pregnant-mare serum despite previous administration of testosterone propionate, which inhibits the cyclic phenomenon of the ♀ genital tract.

**Influence of the uterus on the corpus luteum,** O. Hechter, M. Fraenkel, M. Lev, and S. Soskin (*Endocrinology, 26 (1940), No. 4, pp. 680–683, fig. 1*).—Study was made of the persistence of corpora lutea in pregnant rats following hysterectomy and intraperitoneal implantation of pieces of oestrous and dioestrous uteri. Of 19 ♀♀ so treated, 13 went into oestrus before the sixteenth day, indicating resorption of the corpora lutea. Since differences in the rate of luteal resorption seemed related to the endometrial glands and the stage of oestrus at which the implants were taken, the placenta and uterus were thought to be the important factors in corpus luteum absorption and the recurrence of heat.

**The effect of castration on body weight and length of the male albino rat,** H. S. Rubinstein, A. R. Abarbanel, and A. A. Kurland (*Endocrinology, 25 (1939), No. 3, pp. 397–400, fig. 1*).—Castration of ♂ rats at 22 days of age was found to suppress body weight and body length.

**Observations on spermatogenesis in rats,** E. and E. C. Cutuly (*Endocrinology, 26 (1940), No. 3, pp. 503–507*).—Subcutaneous injections of 3 mg. of androgenic substance in the form of testosterone propionate or dehydroandrosterone acetate were given for 24 days to normal and hypophysectomized ♂ rats beginning at from 29 to 177 days of age. The testes of rats hypophysectomized at 29 days of age showed degeneration and size reduction even though treated with androgen. The animals hypophysectomized at 34 days of age did not increase significantly, but there were some structurally normal sperm produced. Spermatogenesis and testicle size were well maintained but were less than in normals.

**Studies on the inhibitory hormone of the testes, II–IV** (*Endocrinology, 25 (1939), Nos. 3, pp. 391–396, figs. 2; 4, pp. 568–571, figs. 10; 26 (1940), No. 4, pp. 656–661, figs. 7*).—Continuing this series,[3] three papers are presented, as follows:

II. *Preparation and weight changes in the sex organs of the adult male white rat*, B. Vidgoff, R. Hill, H. Vehrs, and R. Kubin.—Daily injections of ♂ rats for from 28 to 35 days with extracts of bull testes reduced the size of the sex organs, especially the prostatic lobes. The inhibitory principle was lost from an extract from which the residual sodium sulfate was removed by precipitation with alcohol.

III. *Histological effects on the male sex organs of the white rat*, B. Vidgoff and R. Hill.—An extract of bull testes was found to possess an inhibitory action on spermatogenesis and produce atrophy in the cells of the prostate and seminal vesicles of the rat. The result is thought to be due to interference with the pituitary and its effect in producing ♂ hormone by the testicle.

IV. *Effect on the pituitary, thyroid, and adrenal glands of the adult male rat*, B. Vidgoff and H. Vehrs.—Treatment of normal adult ♂ rats with the inhibitory testes hormone decreased the pituitary weight, while the adrenals increased in weight and weights of the thyroids were not significantly changed. Cytological changes in the glands were noted, and the similarity between these effects and those of oestrone and testosterone are discussed.

**The influence of estriol, estradiol, and progesterone on the secretion of gonadotropic hormones in parabiotic rats,** C. Biddulph, R. K. Meyer, and L. G. Gumbreck. (Univ. Wis.). (*Endocrinology, 26 (1940), No. 2, pp. 280–284*).—Determination was made in parabiotic rats of the effectiveness of oestradiol,

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[3] Studies on the aqueous testicular hormone.—I, Changes in male secondary sex organs (preliminary report), B. Vidgoff, H. Vehrs, and R. Hill. West. Jour. Surg., Obstet., and Gynecol., 46 (1938), No. 12, pp. 648–650.

oestrone, and oestriol in preventing castration hypersecretion of the pituitary. These substances were found to rate in the above order, which was the same as their relative effectiveness in producing vaginal cornification.

**Metabolism of the estrogens: The effect of liver and uterus upon estrone, estradiol, and estriol**, C. G. HELLER (*Endocrinology, 26 (1940), No. 4, pp. 619–630*).—Study by the rat uterus assay method in vitro showed that by incubation with liver and kidney slices oestradiol was inactivated, probably by an enzymatic destruction and not by conjugation or conversion to a less active form. Incubation with minced uterine tissue, spleen, lung, heart, and kidney caused oestrone to be converted to a more active substance. Oestriol was only mildly affected by liver tissue, in contrast with the destruction of oestrone and oestradiol. Oestriol may therefore prove more potent on oral administration than the others.

**Pituitary mitotic changes after the administration of estrogen and after ovariectomy**, W. C. KUZELL and W. C. CUTTING (*Endocrinology, 26 (1940), No. 3, pp. 537, 538*).—Although oestrogen injected into ovariectomized immature rats weighing about 250 gm. showed no consistent increase in pituitary mitosis following colchicine injection, oestradiol or theelin injections caused a considerable and prolonged pituitary growth, as indicated by sustained mitotic reactions.

**The estrogen-progesterone induction of mating responses in the spayed female rat**, J. L. BOLING and R. J. BLANDAU (*Endocrinology, 25 (1939), No. 3, pp. 359–364*).—Evidence was presented of a synergistic action of oestrogen and progesterone in inducing mating response in the rat. Five rat units of oestradiol given in a single injection did not induce the response in any of 44 rats. However, when 0.4 International Unit of progesterone was given after 48 hr., 20 of 22 animals so treated exhibited the mating instinct in 4.5 hr.

**The effect of testosterone propionate on the ovariectomized mature rat**, M. and C. MAZER (*Endocrinology, 26 (1940), No. 4, pp. 662–666, figs. 6*).—Daily injection of 2 mg. of testosterone propionate into 22 ovariectomized adult ♀ rats after 2 days' administration of oestradiol caused an early increase in the weight of the uterus and later enormous enlargement of the preputial gland (progesterone effect), as compared with the development in control ♀♀. Cornification of the vaginal epithelium was not noted. The adrenal glands were smaller in treated than in control ♀♀.

**Variations in the effectiveness of percutaneously applied androgens in the rat**, D. NELSON, R. R. GREENE, and J. A. WELLS (*Endocrinology, 26 (1940), No. 4, pp. 651–655*).—Employing 219 rats, part of which were castrated, the authors compared the effects of testosterone and testosterone propionate applied percutaneously and subcutaneously in alcohol, peanut oil, lanolin, and ointment for the maintenance and growth of prostates and seminal vesicles. Testosterone and testosterone propionate were more effective percutaneously in alcohol than in ointment.

**Physiology of development of the feather.—III, Growth of the mesodermal constituents and blood circulation in the pulp**, F. R. LILLIE (*Physiol. Zool., 13 (1940), No. 2, pp. 143–176, pls. 4, figs. 9*).—Continuing this series (E. S. R., 81, p. 195), the author found that in the growth of feathers in White and Brown Leghorns, determined at 2-day intervals from the thirteenth day of regeneration until completion, the pulp grows at the same rate as the feathers until it begins to be resorbed in about 8 days and is finally completely resorbed. In a complete molt the estimated dry weight of the feathers plus the weight of the pulp constituted 25 percent of the weight of a 1,642-gm. cock.

**Physiology of development of the feather.—IV, The diurnal curve of growth in Brown Leghorn fowl**, F. R. LILLIE and H. WANG (*Natl. Acad. Sci. Proc., 26 (1940), No. 1, pp. 67–85, figs. 6*).—In further continuation of this series

involving determination of differences in feather growth, noted above, measurements were made at 6-hr. intervals beginning at 12 and 9 o'clock in different groups of Brown Leghorn capons. Ten feathers on the breast and saddle which had been actively regenerating for 25 and 28 days showed with the 12 o'clock base that growth rate declined markedly from midnight to 6 a. m. With the 9 o'clock base, depression in growth rate was noted during the period from 9 p. m. to 3 a. m., but the decrease was less than from midnight to 6 a. m. in the other series. By arbitrary division of the 6-hr. periods it was concluded that the least growth occurred from midnight to 3 a. m. Support was thus given to the assumption that the diurnal growth is a flowing and not an angular curve. The rather sudden rise in temperature in different species of birds at about 3–4 a. m. resulted in an increase in the feather growth. The relation of the metabolic level to feather growth is discussed.

**Research on sexual dimorphism of the feather color in the Barred Plymouth Rock breed of chickens** [trans. title], A. AGOSTINI (*Arch. Zool. Ital., 26 (1939), pp. 319–339, figs. 6; Fr., Eng., Ger., abs., pp. 338, 339*).—A quantitative study of the barred pattern on ♂ and ♀ Barred Plymouth Rocks showed that the width of the double bar in the ♂ birds was smaller than that in the feathers of the ♀♀. The width of the black bar in relation to the double bar was smaller in the ♂ feather. The feather of the juvenile bird also had a wider bar and a greater quantity to black pigment in ♀♀. Sex hormones seemed to be independent, but the genes were evidently directly responsible for the width of the bar as determined by the presence of the double and single sex-linked genes for barring in the two sexes.

**The effect of male sex hormone on the developing ovaries of young fowls,** E. H. HERRICK and C. H. LOCKHART. (Kans. Expt. Sta.). (*Endocrinology, 26 (1940), No. 3, pp. 508–510*).—Studies made of follicle and comb development in chicks injected with testosterone propionate from hatching until 12 and 17 days and more of age showed slightly smaller ovarian size and less follicle development than the controls, indicating the inhibition of ♂ hormone on ovarian development.

**Estrogens of the fowl,** H. W. MARLOW and D. RICHERT. (Kans. State Col.). (*Endocrinology, 26 (1940), No. 3, pp. 531–534*).—Assay was made of the oestrogenic potency of alcohol extracts of fresh egg yolk, immature ova, follicular membrane, and hen ovaries. The results showed that oestrogen was present only in small amounts in the ovaries and follicles of laying hens. The largest amount of oestrogen present was 166 rat units per kilogram in the follicular membrane.

**An undescribed type of partial sex reversal in dove hybrids from a subfamily cross,** O. RIDDLE and M. W. JOHNSON (*Anat. Rec., 75 (1939), No. 4, pp. 509–527, pls. 2, fig. 1*).—Thorough histological study was made of the gonads of 21 subfamily hybrids (Zenaidura × Streptopelia) ranging in age from hatching to over 3 yr. In early stages there was only a left gonad, which remained small although moderately active germinal epithelium was noted. In later and adult stages the gland remained small, without production of clearly recognizable germ cells. The gland became filled with testislike tubules. The repression of general development was observable in germinal and somatic tissues of both sexes. The progeny of the wide crosses thus showed sex reversal and total exclusion of the ♀ sex.

**Technic for hypophysectomy of pigeons,** J. P. SCHOOLEY (*Endocrinology, 25 (1939), No. 3, pp. 372–378, figs. 6*).—A description is given of the operation of hypophysectomizing pigeons by the parapharyngeal approach.

## FIELD CROPS

**[Field crops work in Maine]**, R. M. BAILEY, J. A. CHUCKA, A. HAWKINS, D. S. FINK, F. CHADWICK, JR., B. E. BROWN, G. W. SIMPSON, M. D. SWEETMAN, R. BONDE, and E. C. MEYER. (Partly coop. U. S. D. A.). (*Maine Sta. Bul. 397 (1939), pp. 721, 722, 773–775, 785–787, 810, 811–817, 821–824*).—Report is made again (E. S. R., 81, p. 34) on fertilizer tests with potatoes, including rates of application with the normal and other spacings, different formulas, variations in potassium, magnesium, and boron contents, acid v. neutral fertilizers, lime v. unlimed soil, phosphorus carriers, fertilizer in powder v. pellet form, and mealiness in potatoes; roguing service for producers of foundation seed potatoes; bulk v. box storage of potatoes; variety tests with corn, oats, wheat, barley, and alfalfa; pasture improvement by fertilization and other practices; and the fertilizer and cultural requirements of Ladino clover.

***[Field crops investigations by the Wisconsin Station, 1938–39]***. (Partly coop. U. S. D. A., 12 expt. stas., et al.). (*Wisconsin Sta. Bul. 449 (1940), pp. 12–15, 42–46, 47, 48, 68–71, 74–77, 79–85, figs. 7*).—Brief reports of progress (E. S. R., 81, p. 502) are made from agronomic investigations at the station and substations, comprising cultural and fertilizer practices with hay crops, including red and alsike clovers, timothy, and reed canary grass, and control of weeds in hayfields, and variety, cultural, rotation, and fertilizer tests with oats, all on peat land, by A. R. Albert; tests of potato varieties for yield, by G. H. Rieman, for blackening when cooked, by W. E. Tottingham, and for scab resistance, by J. C. Walker and R. H. Larson; studies of scab-resistant bud mutant potato varieties, by Rieman; the progress of a 3-yr. breeding program for scab resistance in potato breeding stocks, by Rieman, Walker, and Larson; fertilizer tests with cigar tobacco, by J. Johnson and W. B. Ogden; tests of Vicland (Victoria×Richland) oats, by H. L. Shands and B. D. Leith; comparative tests of malting barleys for yield, cultural requirements, and malting quality, by J. G. and A. D. Dickson, Shands, and B. A. Burkhart; comparisons of Wisconsin strains of hybrid corn for silage production and tests of different planting rates with hybrid corn, both by N. P. Neal and J. B. Washko; a study of the effect of kernel size and shape on corn yields, by Neal; weed killing v. mulching in corn cultivation, by Leith; weed control in northern Wisconsin by cultivators and chemicals, by E. J. Delwiche; control of field bindweed and leafy spurge with sodium chlorate at rates depending upon the organic matter content of the soil, by A. Schwendiman, O. S. Aamodt, and B. M. Duggar; improvement of alfalfa-timothy seedings by the use of cultipacker, by H. L. Ahlgren, F. W. Duffee, and Leith; performance and carrying capacity of bromegrass pasture, by Ahlgren and I. W. Rupel; variation in hydrocyanic acid content of Sudan grass grown in different localities in the United States and Canada, by Ahlgren and P. Hogg; trials of alfalfa varieties and strains in northern Wisconsin, by Delwiche; studies of sterility in alfalfa due to starvation of endosperm and the significance of double fertilization in alfalfa and other species, both by D. C. Cooper and R. A. Brink; and the relation of chromosome number due to infection of legumes by root nodule bacteria, by L. Wipf and Cooper.

**Turf making and lawn management in Rhode Island**, J. A. DEFRANCE (*Rhode Island Sta. Misc. Pub. 6 (1940), pp. [33]*).—Leaflets on lawn and turf problems, included in this publication, are concerned with lawn, soil, and seedbed preparation, fertilizer and lime, seeds and seeding, and fall seeding of the lawn; spring and fall care of the lawn and renovation of poor lawns; control of moss in the lawn; brown patch and dollar spot diseases (in cooperation with

L. E. Erwin), and leaf spot diseases; control of ants in lawns and putting greens and of earthworms, white grubs, Japanese beetle grubs, and sod webworms; salt water injury to turf and lawn soils; and "scald" of bentgrass.

**Hybrid corn adaptation trials in Wyoming in 1939**, W. A. Riedl (*Wyoming Sta. Bul. 236 (1940), pp. 20*).—Tests in 5 localities in 1939 indicated that at altitudes below 6,000 ft. on irrigated land large increases in yields of shelled corn and green and dry forage could be obtained by the use of adapted hybrids. At Torrington and Pine Bluffs the best hybrids gave increases of from 40 to 50 percent of grain and from 25 to 50 percent in forage yields over standard local varieties, and at Worland yield increases of 115 percent in grain and 104 percent in green forage were obtained. Uncertainty of moisture necessitated further trials to determine the best hybrids for dry land areas. In irrigated areas above 6,000 ft. in altitude, great variations in dates of early and late killing frosts and the generally cool climate and short growing season make it doubtful if there are hybrids adapted well enough to grow corn for grain.

**Soaking of cotton seed in boric acid as a means going to satisfy its boron requirement and increase salt resistance**, V. A. Novikov and R. O. Sadovskaja (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 23 (1939), No. 3, pp. 276–279, figs. 3*).—The authors report increases in the salt resistance and yield of cotton due to boron treatment of the seed with concentrations of boric acid varying over a rather wide range. The results suggest commercial application, but field tests on a large scale should precede.

**Potato production in the Western States**, W. C. Edmundson (*U. S. Dept. Agr., Farmers' Bul. 1843 (1940), pp. II+28, figs. 19*).—Superseding and amplifying Farmers' Bulletin 1639 (E. S. R., 64, p. 222), which it resembles in general scope, this publication also discusses dry land as well as irrigated potato production and includes Nebraska among the States in the group.

**Soybean varieties for hay and grain**, T. E. Odland and G. F. Lea (*Rhode Island Sta. Bul. 271 (1939), pp. 19, figs. 5*).—Comparative tests, 1933–37, indicated Manchu, Dunfield, and Cayuga soybeans, averaging 41.1, 34.3, and 31.1 bu. per acre, respectively, as best adapted for seed in Rhode Island, and Wilson, Wilson-5, Kingwa, and Dunfield for hay or for silage when grown in combination with corn. Hay yields averaged from 2 to 3 tons per acre. Cayuga was the earliest variety in the tests and Kingwa retained its leaves the best. In 1937, the hay contained from 16 to 18 percent of protein and the seed averaged about 40 percent. Yields and other agronomic data and the composition of hay and seed of the varieties tested are tabulated, and suggestions are made on growing the crop.

**Advisability of extensive introduction of soybeans investigated**, D. W. Pittman (*Farm and Home Sci. [Utah Sta.], 1 (1940), No. 1, p. 3, fig. 1*).—Although soybeans grown by the station on good irrigated land under favorable conditions have made from 22 to 27 bu. of threshed beans per acre, worth from $27.50 to $33.75, their limitations include few adapted varieties, no local market, and the probability that they would not compete with alfalfa for forage. Soybeans would have to be more profitable than the crop displaced on good irrigated land. Cultural needs are outlined briefly.

**Tobacco varieties and strains in Wisconsin**, J. Johnson and W. B. Ogden (*Wisconsin Sta. Bul. 448 (1939), pp. 30, figs. 13*).—The merits of varieties and strains of cigar-binder and stemming tobacco now available in Wisconsin, including the Havana Seed variety and its strain Comstock Spanish, Connecticut Havana Seed, Havana Nos. 38, 142, and 211, and Smith Seed, and Root-Rot Resistant Cigar-Binder and Big Seed varieties, are described. Comments also are made on the relation of soil to variety used, tobacco improve-

ment by selection and crossing, and on common problems of the trade and growers, and suggestions are included for tobacco seed growers.

The Wisconsin growers market chiefly two grades of leaf tobacco known as cigar-binder leaf (sorting tobacco) and stemming leaf, a distinction based on quality of cured product. The several varieties or strains grown in the State, in general, belong to either the Havana Seed group, which produces the best quality of leaf, or to the Big Seed group, which ordinarily produces larger acre yields. While quality of cured leaf more often depends on the soil and seasonal conditions than on variety, an undesirable variety may reduce greatly benefits accruing from favorable soil and seasonal conditions. Because of a period of drought years and low prices, a very high percentage of the coarser Big Seed varieties has been grown in the State chiefly for the stemming market, but present prospects for tobacco leaf sales appear more favorable in the cigar-binder market where Havana Seed varieties are in greatest demand. Big Seed varieties often have given better yields to the acre only because they are more resistant to the black root rot disease than Comstock Spanish or Havana No. 38. The station, therefore, has tried to introduce root rot resistance into the Havana Seed variety. Some strains of this type, e. g., Havana Nos. 142 and 211, have been grown extensively, and more improvement in this direction is anticipated.

**The chronology of Hope wheat,** E. B. Babcock. (Univ. Calif.). (*Jour. Hered., 31 (1940), No. 3, pp. 132, 133*).—Additional information (E. S. R., 65, p. 325) on the origin and history of Hope wheat was provided by McFadden.

**Seed inspection,** F. A. McLaughlin (*Massachusetts Sta. Control Ser. Bul. 102 (1939), pp. 104, fig. 1*).—The purity, germination, and weed seed contents are tabulated for 366 official samples of field crops seed and mixtures and germination for 627 samples of vegetable seed collected in Massachusetts during the period December 1, 1938, to December 1, 1939. Results of field tests for trueness to type and variety on 77 of 193 lots (tested) of beans, beets, cabbage, carrots, corn, lettuce, parsnips, peas, rutabaga, spinach, and turnip, in cooperation with G. B. Snyder; studies of flower seeds made in cooperation with C. L. Thayer, including tests of 224 samples of seed for purity, germination, and performance; and type and performance studies with 72 samples of seed corn, in cooperation with W. G. Colby, are included.

**Farm losses from weeds greater than from all other pests,** R. J. Evans (*Farm and Home Sci. [Utah Sta.], 1 (1940), No. 1, p. 10, fig. 1*).—A brief report of activities and accomplishments under the State weed control program is given, with a summary of control recommendations for the 1940 program.

## HORTICULTURE

**[Horticultural studies by the Maine Station],** R. M. Bailey, I. M. Burgess, J. A. Chucka, S. M. Raleigh, F. B. Chandler, and I. C. Mason (*Maine Sta. Bul. 397 (1939), pp. 695, 706–708, 713, 714, 715, 824, 825, fig. 1*).—Among studies the progress of which is discussed are a comparison of solid blush and striped strains of McIntosh apples; sweet corn breeding, spacing, and fertilization; breeding and planting rates for beans; vegetable variety trials; planting date for tomatoes; boron deficiency in 11 *Brassica* species; and blueberry investigations, including the use of growth substances, breeding, fruitfulness, and weed control.

**[Horticultural studies by the Wisconsin Station],** P. H. Hornburg, E. Truog, A. R. Albert, J. P. Jolivette, R. H. Larson, F. J. Le Beau, J. G. Moore, and E. J. Delwiche (*Wisconsin Sta. Bul. 449 (1940), pp. 7–11, 46, 47, 77–79*).—Reports are presented on the results of studies dealing with the fertilizer require-

ments of sweet corn, canning peas, and table beets; varieties of vegetables for peat soils; cross-pollination requirements of hybrid plums; testing of canning pea varieties; and the rate of seeding peas.

**[Horticulture at the Dominion Experimental Station, Morden, Man.]** (*Canada Expt. Farms, Morden* (*Man.*) *Sta. Rpt. Supt., 1931–37, pp. 4–55, figs. 10*).—Covering the 7-yr. period from 1931 to 1937, this report contains information on variety and cultural tests with fruits, vegetables, and ornamentals; pollination of fruits; propagation of fruits and ornamentals; and the control of various insects, diseases, and other pests.

**The effects of a deficiency of certain essential elements on the development and yield of carrots, onions, and radishes grown in sand cultures under glass,** R. M. Woodman (*Jour. Pomol. and Hort. Sci., 17* (*1940*), *No. 4, pp. 297–307*).—A lack of K produced a general tendency to scorch and wilt of portions of the tops of the plants of all three species. Insufficient N resulted in onion foliage of a very pale color and of a peculiar outlining in red of the cotyledons in the radish. Deficiencies of N and P resulted in greatly decreased yields. Deficiencies of K, Ca, or Mg decreased yields to a much lesser degree.

**Fertilizing onion sets, sweet corn, cabbage, and cucumbers in a four-year rotation,** J. W. Lloyd and J. P. McCollum (*Illinois Sta. Bul. 464* (*1940*), *pp. 217–236, figs. 2*).—Since onion sets, sweet corn, cabbage, and pickle cucumbers are important crops in the market gardens of northeastern Illinois, a plan was devised for growing the crops in a 4-yr. rotation which included three green manure crops and various combinations of fertilizing materials containing N, P, and K. Over the years 1925 through 1936, cucumbers showed a very marked response to P, the yields increasing progressively when P was increased from 0 to 4 to 8 percent. P also stimulated early development of the crop.

Onion sets responded definitely to N in commercial form, the highest yield and greatest increase over the control plat being secured with the highest N. The omission of K from the fertilizer notably reduced the yield of onion sets. Sweet corn was the least responsive of all four crops to fertilizer treatments. Cabbage responded definitely to N and P, but not to K.

Comparing stable manure and commercial fertilizers, the authors found that cucumbers responded better to manure, while onions, corn, and cabbage yielded better with commercial fertilizers. Profitable returns were secured with certain treatments on onions, cabbage, and cucumbers, but none gave economical increases with sweet corn. Unit costs of increased yields were much lower with a complete 4–8–4 fertilizer mixture than with stable manure.

**The Mingold tomato and the Duluth snap bean,** T. M. Currence. (Minn. Expt. Sta.). (*Minn. Hort., 67* (*1939*), *No. 4, p. 65, figs. 2*).—Data are presented on the origin and distinguishing characters of two new vegetables developed by the station.

**Deep soil treatment is essential for asparagus,** L. G. Schermerhorn (*N. J. State Hort. Soc. News, 21* (*1940*), *No. 3, pp. 1203, 1204, 1215, figs. 4*).—In the spring of 1938 asparagus roots were planted at various depths, with and without subsoiling, and fertilized in different manners. The most extensive root system and the deepest penetration of roots were observed in the row treated with a ton of limestone and a half ton of superphosphate per acre in the bottom of the row before subsoiling. It is suggested that established beds should be given sufficient lime to keep the pH of the surface soil close to 6.6 and thus maintain the calcium at a high level. In addition, beds under 3 yr. should have a spring application of 1,000–1,500 lb. of a 5–10–10 fertilizer. Beds 3 yr. or older should have an annual treatment of 1,500–2,000 lb. of 5–10–10 material, one-half broadcast before cutting and one-half applied immediately following the close of the cutting season.

**A comparative test of some bean varieties in 1939,** A. E. HUTCHINS. (Minn. Expt. Sta.). (*Minn. Hort., 68 (1940), No. 3, p. 52*).—Of seven varieties of garden beans tested in 1939 in four randomized blocks, Giant Stringless Green Pod was first in earliness and total yield.

**Early cabbage experiments,** F. K. CRANDALL (*Rhode Island Sta. Bul. 272 (1939), pp. 20, figs. 3*).—Stating that cabbage ranks fourth among the vegetable crops grown in the State, the author presents data on the results of fertilizer and soil management studies. Green manure was found a satisfactory substitute for stable manure in the growing of this crop, although yields were somewhat higher where stable manure was applied. While no lime was applied for the cabbage crop, rather liberal amounts were used in growing the other crops in the rotation. These liberal applications produced a soil reaction which was only slightly acid. Good yields were obtained under these conditions. Nitrogen was more necessary for growing this crop than either phosphorus or potash. On the average it was found about as satisfactory to apply all fertilizer before setting as to sidedress with part of the nitrogen. Small increases in yields were obtained by increasing the amounts of fertilizer applied from 1,500 to 2,025 lb. More than 2,025 lb. failed to produce a larger yield, except where green manures were used. The cost per barrel of growing cabbage was found to be practically the same whether stable manure or green manure and chemicals were used. In order to grow early cabbage, it is suggested than an extra-early variety be selected, that good seed be secured and treated for disease, that plants be grown under cool greenhouse temperatures and hardened moderately, and that the plants be set as early as weather will permit in a sandy loam type of soil well supplied with organic matter. Lime should be applied where the soil is below a pH of 6.0, and from 1,500 to 2,000 lb. of a fairly high-nitrogen fertilizer should be broadcast. The plants should be treated early in May with corrosive sublimate and should be cultivated sufficiently often to control weeds.

**Variation in solids of the juice from different regions in melon fruits,** G. W. SCOTT and J. H. MACGILLIVRAY (*Hilgardia [California Sta.], 13 (1940), No. 2, pp. 67–79, figs. 3*).—The expressed juice taken from systematically cut cross and longitudinal sections of cantaloups and honeydew melons was tested as to the concentration of solids. There was little difference between the soluble-solids content of the different longitudinal sections. However, different sections of a longitudinal slice were variable. In the cross-section pieces, the stem-end quarters were always lowest in soluble solids, with either the middle-blossom quarter or the blossom quarter highest in percentage. When the flesh of a single section was divided into thirds from the placenta outward, the inner third was always highest in soluble solids. The placental tissues were high in percentage of soluble solids. Following storage at room temperatures for 6.5 days, cantaloups were lower in soluble solids, while honeydews were slightly higher. Storage had little effect on the relative ratings of different sections of a given melon.

**Factors affecting the total soluble solids, reducing sugars, and sucrose in watermelons,** D. R. PORTER, C. S. BISSON, and H. W. ALLINGER (*Hilgardia [California Sta.], 13 (1940), No. 2, pp. 31–66, figs. 9*).—Observing that edible quality in watermelons is determined by several chemical and physical factors, the authors measured the total soluble solids and sugars in important commercial varieties and certain hybrids, all grown at Davis, Calif. It was apparent that factors for sugar content are heritable, but that certain environmental conditions may affect total soluble solids and sugars of genetically pure

strains. High quality was largely dependent upon high sugar content, with deep-red color and pleasant texture of the edible flesh also important. The various Klondike types were consistently higher in sugar content than the more important eastern United States varieties. Of the wilt-resistant kinds, Klondike R16 and Klondike R7 excelled in sugar content.

Trends for total soluble solids and total sugars were essentially alike, and approximately 85 percent of the total soluble solids were sugar. A refractometer reading on two or three drops of juice taken from the center of one-half of a fully mature fruit gave approximately the same result as when a composite sample was taken from the entire edible tissue located almost entirely within the seed zone of the same half. Juice taken from near the stem end usually contained less sugar than that collected near the blossom end. The formation of reducing sugars in Klondike began sometime previous to the tenth day, while sucrose was seldom detected before the twentieth day after anthesis. At maturity, approximately 35 percent of the total sugar was sucrose. Following maturity there was, in both attached and room-stored fruits, a rapid increase in the ratio between sucrose and reducing sugars. Of the reducing sugars, levulose predominated over dextrose in limited tests, with indications that the dextrose increases more rapidly than the levulose. Inbreeding is suggested as a means of eliminating low-sugar individuals and improving strains and varieties.

**Effect of nitrate of soda on the response of spinach to length of day,** J. E. Knott. (Cornell Univ.). (*Plant Physiol., 15 (1940), No. 1, pp. 146–148, fig. 1*).—Observations on Long Standing Bloomsdale spinach plants sown outdoors at Ithaca, N. Y., on April 26 in drums of soil, part of which were supplied with nitrate of soda in divided applications and part given no nitrate, showed the nitrated plants to be slower in beginning seedstalk elongation than were the nonnitrated. The large quantity of nitrate of soda, 6 tons per acre, had delayed seedstalk initiation and development, and the results indicated the need of considering the level of fertility in photoperiodic experiments. The nitrated plants were stockier, with thicker leaves of a darker green color and with more savoying.

**Orchard management in Colorado,** E. P. Sandsten, F. M. Green, and L. R. Bryant (*Colorado Sta. Bul. 458 (1940), pp. 55, figs. 5*).—General information is presented on selection of sites, planning the orchard, nursery stock, selection of varieties, provision for effective pollination, preparing the soil, planting, pruning, management of the soil, fertilization, irrigation, thinning, and the control of weeds, insects, diseases, and rodents.

**Growing an orchard in Kansas,** R. J. Barnett (*Kansas Sta. Bul. 290 (1940), pp. 47, figs. 18*).—This revision of Bulletin 254 (E. S. R., 66, p. 538) presents, in the same general manner, information on the extent and location of fruit production, choice of sites; costs and returns; varieties; planting; soil management; cultural care; control of insects, diseases, and other troubles; orchard sanitation; cover crops, etc. Specific information is given on various fruits, including the apple, cherry, peach, plum, pear, quince, and pecan.

**Minnesota fruit breeding farm, report for 1939,** W. H. Alderman and F. E. Haralson. (Minn. Expt. Sta.) (*Minn. Hort. 68 (1940), No. 3, pp. 44, 55*).—Included in this general administrative report are descriptions of promising new seedlings of apples, plums, grapes, strawberries, etc., developed in the fruit breeding program of the station.

**The season of 1939,** W. A. Ruth, H. W. Anderson, and W. P. Flint (*Ill. State Hort. Soc. Trans., 73 (1939), pp. 43–62*).—An analysis is presented of temperature and precipitation conditions and their relation to blooming, frost

injury, and ripening and production of various fruits, including the peach and apple. The distribution and relative abundance of important insect and fungus pests is recorded.

**Studies on production of ethylene in the ripening process in apple and banana,** R. C. NELSON. (Minn. Expt. Sta.). (*Food Res., 4 (1939), No. 2, pp. 173–190, figs. 6; abs. in Minnesota Sta. Rpt. 1939, p. 28*).—Describing the apparatus and procedure used in determining ethylene in plant tissues, the author discusses the results of investigations with six varieties of apple, Wealthy, Patten Greening, McIntosh, Malinda, Haralson, and Northwestern Greening, arranged in the order of increasing storage life. There was a general correspondence between the course of respiration activity and that of ethylene content in stored apples. Varieties with longer storage lives were characterized by lesser capacities to produce ethylene. Ethylene, or a gas of similarly high physiological activity, was produced by bananas during ripening and is probably consumed by the bananas during the period of intensive ripening. The fundamental function of ethylene during the ripening process is believed to be concerned with the hydrolytic processes, although this function probably is not any simple effect on the hydrolytic enzymes.

**Quantitative study of the production of ethylene by ripening McIntosh apples,** R. C. NELSON. (Univ. Minn.). (*Plant Physiol., 15 (1940), No. 1, pp. 149–151, fig. 1*).—Analyses of the gas emanating from apples placed under bell jars held in a room at 20° C. (68° F.) showed that the rate of ethylene production begins to increase rapidly after the onset of the climacteric and reaches a maximum several days later than the respiratory maximum. Evidence is presented to show that, as in the banana, ethylene is consumed during the ripening process of the McIntosh apple.

**Fruit buds, factors affecting their development,** M. J. DORSEY. (Univ. Ill.). (*Ill. State Hort. Soc. Trans., 73 (1939), pp. 278–283*).—In discussing the physiology of fruit bud formation the author points out that a 24-year-old Jonathan tree, from which 6 out of every 7 flower clusters were removed, had 3,703 clusters left. This meant an original 25,921 clusters or, on an average of 5 or 6 flowers per cluster, over 125,000 blooms. The great excess of blooms may be partly reduced by pruning. Fruit thinning to promote annual bearing must be done during the first few weeks after bloom, when the task is difficult and costly.

**Summer's experience in apple thinning,** M. J. DORSEY. (Univ. Ill.). (*Ill. State Hort. Soc. Trans., 73 (1939), pp. 400–405*).—Data are presented on the number of fruits removed from Golden Delicious and Grimes Golden trees. The fruit was thinned so that there was only one fruit per cluster, with clusters spaced 1 ft. or so apart, and with all small and injured apples removed.

**Effect of certain thiocyanate sprays on foliage and fruit in apples,** R. B. DUSTMAN and I. J. DUNCAN. (W. Va. Expt. Sta.). (*Plant Physiol., 15 (1940), No. 2, pp. 343–348, pl. 1*).—In this second contribution (E. S. R., 82, p. 191), the authors report that "soluble thiocyanates, particularly inorganic thiocyanates, used as a spray on apples during the growing season, exert a pronounced physiological effect on both foliage and fruit, as follows: In the foliage the leaves are subjected to spray burn and to a chlorotic condition arising from the effect of the chemical on the green coloring matter of the plant. In the fruit the amount of red color occurring normally tends to be increased, and the green ground-color tends to be reduced or replaced by varying shades of yellow and yellow green."

**Some effects of nitrogen fertilizers on fruit and tree growth of the peach,** R. V. LOTT. (Univ. Ill.). (*Ill. State Hort. Soc. Trans., 73 (1939), pp.*

*223–231*).—In the spring of 1938, 6-year-old Halehaven trees in vigorous condition were given an application of 5 lb. of nitrate of soda on March 28 and a second 5 lb. on June 4. Measurements of the fruits showed that size increased in three fairly distinct periods—the first ending 57 days, the second 76 days, and the third 123 days after bloom. In nonnitrated trees the third stage was reached in 117 days. The first growth period was one of rapid enlargement, the second was characterized by very little increase in size, and the third showed an increasing rate which reached a maximum in the last 3 weeks before harvest. The seasonal trend in dry matter accumulation continued at an undiminished rate, indicating a continued need for food and nutrients. The rapid increase in size, weight, and sugar content during the 2 weeks preceding the soft-ripe stage suggested the desirability of letting the fruit approach as near the soft-ripe condition as is practicable.

Nitrogen fertilization delayed maturity 6 days, gave 20-percent larger fruits, caused no significant difference in sugar content or detectable difference in quality, and brought about a less intense color and fewer split pits. With regard to growth, nitrogen resulted in darker green and larger leaves, more and longer shoots, a higher percentage of fruit set, and less dropping of immature fruits.

**Peach trends in South Carolina,** A. M. Musser. (Clemson Agr. Col.). (*Ill. State Hort. Soc. Trans., 73 (1939), pp. 206–217*).—Information is presented on the extent and distribution of peach orchards, varieties, time of ripening, competing areas, etc. The Elberta is the leading variety in the State, comprising 72 percent of the trees in the Piedmont orchards, 37 percent of the Sandhill orchards, and 31 percent of the "Ridge" orchards.

**The pollination of the plum on Vancouver Island, British Columbia,** E. R. Hall (*Sci. Agr., 20 (1940), No. 8, pp. 488–496, fig. 1*).—At Saanichton, B. C., pollination trials with plums, mostly *Prunus domestica* varieties, showed many to be unable to mature fruit from self-pollination. Burbank, Diamond, Gold, Golden Drop, Grand Duke, Mallard, Michelson, Peach, Pond, and Washington were in this group. Self-pollination of Monarch, Sugar, Bradshaw, and Yellow Egg gave approximately the same results as open-pollination. Green Gage and Victoria set considerably more fruit when selfed than when exposed to open-pollination. Victoria and Michelson were effective pollinizers for several varieties. Except for the very earliest and very latest varieties, there was adequate overlapping to insure opportunity for cross-pollination.

**The blueberry in New York,** G. L. Slate and R. C. Collison (*New York State Sta. Cir. 189 (1940), pp. 26, figs. 7*).—Stating that the cultivation of improved varieties of high-bush blueberries is a relatively new industry, the authors present general information based on observations and on data accumulated elsewhere. Included are discussions as to the selection of sites, soil requirements, water tables, varieties, planting, cultural care, fertilizers, pruning, propagation, fruiting habits, possible yields, harvesting and marketing, etc.

**Winter protection for strawberries,** A. S. Colby. (Univ. Ill.). (*Ill. State Hort. Soc. Trans., 73 (1939), pp. 109–117*).—In covering Dunlap plants with wheat straw, corn stover, and soybean refuse, the stover soon became water-soaked and ineffective. The wheat straw gave good protection when in sufficient depth. Soybean refuse was also reasonably effective but encouraged mice in search of the scattered beans.

In another study on the use of shredded cornstalks, wheat straw, and soybean refuse it was observed that early covering (October 24) caused smothering injury. November 9 treatments gave much better results. The application of 4 in. of wheat straw on six dates from November 9 to February 3 showed the least crown injury with the earliest treatment. There was six times as much

injury when covering was delayed until February 8. As to variety, Premier (Howard 17) was most resistant to crown injury, followed in order by Dorsett, Aroma, Redheart, Catskill, and Fairfax. Of the three materials used, wheat straw was the most efficient in reducing winter injury to the crowns.

**The evaluation of grape varieties in the Northeast,** R. WELLINGTON (*N. J. State Hort. Soc. News, 21 (1940), No. 3, pp. 1211, 1214*).—Based on the results of conferences and correspondence of horticulturists of northeastern experiment stations, a classification is presented of grape varieties. The two leading commercial varieties were Concord and Niagara. Included with desirable varieties is a list of varieties recommended for discard.

**Relation of growth to fruit bearing in mangoes,** L. SINGH and A. A. KHAN (*Indian Jour. Agr. Sci., 9 (1939), No. 6, pp. 835–867, figs. 6*).—Observations on the flowering and growth of individual labeled shoots showed a well-defined antagonism between growth and productivity on the same shoots during the growing season. Shoots that flowered one season either did not flower or flowered very sparsely the following season, thus indicating a tendency toward alternate bearing. Shoots that flowered in any given season made most of their extension growth early in the preceding growing season and ceased growth about 1 mo. earlier than did those shoots which did not bloom the following spring. Thus growth flushes initiated early were more important to subsequent fruiting than were those initiated later in the season. Defloration early in the season resulted in growth activation in the same season and flowering the subsequent season, suggesting a practical means of securing annual fruiting in the mango.

**Some factors affecting pecan yields,** G. H. BLACKMON. (Fla. Expt. Sta.). (*Southeast. Pecan Growers Assoc. Proc., 33 (1939), pp. 14–16, 18, 20–23*).—Among points considered are varieties, soils, nutrient requirements and deficiencies, and the need of maintaining healthy foliage.

**Flowering, fruiting, yield, and growth habits of tung trees,** R. D. DICKEY and W. REUTHER (*Florida Sta. Bul. 343 (1940), pp. 28, figs. 16*).—A study of records taken over a period of 17 yr. on the original 10 trees grown at Gainesville and received as seedlings from the U. S. Department of Agriculture Plant Introduction Gardens at Chico, Calif., showed that yielding capacity has been a rather constant characteristic, suggesting that the trees have an inherited fruiting capacity. A young grove of 136 trees grown from a mixture of seed collected from the original 10 trees and other sources showed the same general trend toward consistency of performance. Both sets of data emphasize the importance of exercising care in selecting seed for future plantings.

Of various characters, such as yield, fruiting and flowering habits, tree size and conformation, and height of branching, studied in relation to potential yielding capacity, none could be used arbitrarily as an index to desirability for propagation or breeding. It was, however, apparent that of these characters total yield perhaps offers the best index, especially when correlated with cluster-fruiting habit. In selecting parental trees, vigor, conformation, fruiting habit, fruit size, and oil content should be considered, in addition to total yield. Summing up, the authors observed a consistent difference in bearing capacity of seedling tung-oil trees which apparently was due to genetical constitution. There was a high percentage of low-yielding trees in populations grown from seed from an unselected source, as compared to a larger percentage of good yielders in plantings grown from high-bearing trees. The height of branching of nursery seedlings was apparently a definite genetic character.

**Irregular flowers in phlox,** J. P. KELLY. (Pa. Expt. Sta.). (*Jour. Hered., 31 (1940), No. 4, pp. 169–171, fig. 1*).—A record is presented of a plant which produced flowers with petals varying from the normal five to only one. The

offspring of this plant were of two kinds, the normal and with varying proportions of irregular flowers. A single recessive gene appeared to be the genetic basis of the phenomenon, with environment greatly affecting the expression of the defect.

## FORESTRY

**[Forestry studies by the Wisconsin Station]**, D. P. White, S. A. Wilde, E. Wittenkamp, E. L. Stone, W. E. Patzer, J. C. Kopitke, and C. J. Krumm. (Coop. U. S. D. A. et al.). (*Wisconsin Sta. Bul. 449 (1940), pp. 16–19, figs. 2*).—Progress reports are presented on the following studies: The relation of ground water level to the growth and survival of forest trees, causes of failure of trees on prairie soils, fertilizer needs of forest seedlings in the nursery, the relation of K to frost resistance, and the value of composted fertilizers for forest seedlings.

**A lysimeter installation for studying forest influence problems**, H. F. Scholz and J. H. Stoeckeler. (U. S. D. A.). (*Jour. Forestry, 38 (1940), No. 3, pp. 256–260, figs. 7*).—Describing a set of lysimeters established by the U. S. D. A. Forest Service about 5 miles east of La Crosse, Wis., the authors state that in a preliminary check of the performance, as judged by the amount of percolation water obtained over a period of 9 mo., the average percolate from the 10 lysimeters was 148.8 cu. ft., with a maximum variation from the average of only 3.7 percent. The large size of the lysimeter is considered advantageous. Following the preliminary readings, various plants, including native hardwoods, Scotch pine, and bluegrass and annual field crops, were established on the lysimeter surfaces.

**Reconstruction of the hardwood forest soil profile by vegetative covers**, J. T. Auten. (U. S. D. A.). (*Jour. Forestry, 38 (1940), No. 3, p. 229*).—Stating that the real problem in a region of abandoned land is not immediate reforestation but soil improvement, the author discusses the importance of litter cover and surface soil porosity in tree growth. Conifers and so-called weed species may be used on dry sites to provide a protective litter. Three criteria are useful in measuring soil profile building on abandoned hardwood land, (1) the amount of litter, (2) depth of organic matter incorporation in the $A_1$ horizon, and (3) increase in the rate of water infiltration. Sassafras and pines improved the rain-absorbing properties of the soil, while black locust proved of little value, largely because of sod formation. Black locust litter decomposed on the soil surface without much incorporation. Sassafras litter incorporated in the mineral soil and pine litter lay on the surface to form a mat of needles, with the acid extract bleaching the upper mineral soil. It is suggested that sassafras may prove a good soil builder on poor, heavy clay preparatory to the planting of more valuable hardwoods.

**Growth of seedling black locust and green ash in relation to subsoil acidity and fertility**, A. L. McComb and F. J. Kapel. (Iowa State Col.). (*Jour. Forestry, 38 (1940), No. 3, p. 228*).—Where four levels of acidity, namely, 4.3 (the original soil), 6.6, 6.9, and 7.7, were maintained, poor growth of the seedlings of both species occurred where no fertilizer was used. Both species responded favorably to applications of P at all pH levels and gave practically no response to N alone. Both species developed best at pH 4.3 when P was added and at pH 6.9 when no P was applied. Green ash was much more tolerant to alkaline reactions than was black locust.

**Direct seeding of longleaf pine indicated as a practical method of reforestation**, W. G. Wallace (*Jour. Forestry, 38 (1940), No. 3, p. 289*).—A project in which an old cornfield in Reynolds, Ga., was reforested successfully by direct seeding in the winter of 1931–32 is discussed.

**Root and shoot growth of shortleaf and loblolly pines in relation to certain environmental conditions, J. F. Reed** (*Duke Univ., School Forestry Bul. 4 (1939), pp. 52, pl. 1, figs. 7*).—Observations in the Duke Forest throughout the period from April 1935 to August 1936 showed that root growth of both species never actually ceased even in the coldest part of the winter. Total growth of the roots of loblolly and shortleaf pine for the period averaged 47.4 and 26.2 in. per root, respectively. The curves of average daily root growth were markedly similar for both species throughout the period of observation. Although it was difficult to establish an exact mathematical relationship between root development and either temperature or soil moisture, it was evident that deficient soil moisture may limit growth in the summer months, and low soil temperature may have a similar effect during the winter months.

Temperature controlled the seasonal course of shoot growth of both pines. Shoot enlongation of loblolly began before April 1, 1935, and between March 16 and 23, 1936. In shortleaf pine, shoot growth began in the period from April 1 to 9, 1935, and between April 7 and 15, 1936. Cessation of shoot growth in loblolly and shortleaf pines occurred in the first days of August and about August 20, respectively.

**Damage by logging and slash disposal in Idaho ponderosa pine, E. L. Mowat.** (U. S. D. A.) (*Jour. Forestry, 38 (1940), No. 3, pp. 247–255, fig. 1*).—Studies on seven 10-acre sample plats in central Idaho showed that the destruction of trees by felling and by skidding long logs with caterpillar tractors amounted to 1,070 seedlings and saplings, 7.5 poles, and 0.7 timber trees per acre. The number of trees seriously injured but not killed by logging averaged 6.2 per acre. During the first year after logging, 2.5 poles and 0.4 timber trees per acre died as an indirect result of logging, chiefly from bark beetle attack. An average of 544 seedlings and saplings and 6.2 poles per acre were killed by piling and burning slash, this loss varying widely by plats. The percentage of area stocked by trees of any size was reduced from 78 percent before logging to 65 percent after logging on the area with no slash disposal, and to 49 percent on the area with slash piled and burned. Both direct logging damage and destruction by slash burning could be reduced by regulation and closer supervision.

**The utilization of dogwood in the lower South, J. W. Cruikshank.** (U. S. D. A.) (*Jour. Forestry, 38 (1040), No. 3, pp. 284, 285*).—Stating that dogwood lumber is used extensively in the manufacture of shuttles for textile mills, the author presents information on the extent of dogwood lumber utilization and on the specifications of lumber used in the shuttle industry. The 34 shuttle-block mills located in the lower South consumed about 8,000 standard cords of lumber in 1936.

**Fire Control Notes, [April 1940]** (*U. S. Dept. Agr., Forest Serv., Fire Control Notes, 4 (1940), No. 2, pp. II+47–99, figs. 23*).—In the usual manner (E. S. R., 82, p. 629), this quarterly contains articles relating to the technic of forest fire control.

## DISEASES OF PLANTS

**The Plant Disease Reporter, [May 1 and 15, 1940]** (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 24 (1940), Nos. 8, pp. 153–166; 9, pp. 167–188, figs. 4*).—The following items are included:

*No. 8.*—Diseases of fruits and vegetables on the New York market during the months of October, November, and December, 1939, by C. O. Bratley and J. S. Wiant; diseases of shade and ornamental trees—summary of specimens received in 1939 at the New Haven office, division of forest pathology, by A. M. Waterman;

epiphytotic of *Botrytis* blight on gladiolus in Florida, by A. W. Dimock; observations on cereal rusts in Texas, by E. S. McFadden; mealy bug injuries on strawberries growing under glass in Montana, by M. M. Afanasiev; apple scab notes from Massachusetts and New York; brief notes on pink patch (*Corticium fuciforme*) of fescue grasses in Oregon, and downy mildew of vetch in Oregon; corrections to the 1938 crop loss estimates; and stem rust on wheat in Texas, by I. M. Atkins.

*No. 9.*—Known range of the *Cephalosporium* wilt of persimmon in 1939, by B. S. Crandall; the species of the genus *Pseudoperonospora* and their recorded hosts, by G. R. Hoerner; potato psyllids and psyllid yellows in Montana, 1939, by D. G. Pletsch; root rots of potatoes in Montana in 1939, by H. E. Morris; internal discoloration and net necrosis of seed potatoes observed in Massachusetts and New York; some vegetable diseases newly reported in Oregon, including *Ramularia* blight of parsnips, vein banding virus (?) disease of parsnips, and onion yellow dwarf, by F. P. McWhorter and C. E. Owens; tomato fruit pox in Arkansas, by S. B. Locke; fruit diseases in Idaho, 1939, by E. C. Blodgett; reports on the development of apple scab in New York, Illinois, and Arkansas; and brief notes on a surface rot of sweetpotatoes in Texas, downy mildew on spinach in Arkansas, mildew on onion in New York, peach leaf curl in Arkansas, winter injury to peach trees in New York, and downy mildew and bacterial wilt of alfalfa in Virginia.

**[Plant disease work by the Maine Station]** (*Maine Sta. Bul. 397 (1939), pp. 695–697, 699–702, 717, 718, 775, 776, 788–810, 811, fig. 1*).—Progress of research by various staff members—D. Folsom, M. T. Hilborn, E. R. Tobey, B. E. Plummer, Jr., G. W. Simpson, J. Hawkins, R. Bonde, and A. Rich—is briefly noted for the following: Apple scab control, including the effects of various spray and dust materials; apple tree anthracnose (*Pezicula malicorticis*) and perennial canker (*P. malicorticis perennans*) recently established in Maine and their control; strength of mercuric chloride solutions in treating seed potatoes and mercury absorption by potato foliage; Dutch elm disease, "redheart" of birch, and the saprogenic nature of *Fomes fomentarius*, one of the most common birch tree decays in Maine; and potato work, including factors in maintaining foundation seed stocks, virus disease relations in the Green Mountain seed plats, winter testing of seed for virus diseases, net-necrosis and stem-end browning, observations on the prevalence and effects of diseases in Maine during 1938 (including tuber decay by *Phytophthora infestans*, bacterial wilt and soft rot, leaf roll, and a comparison of Sebago and Green Mountain varieties), effects of shallow v. deep planting on yield and on percentage of *Rhizoctonia* and unmarketable tubers, effect on yield of adding different fungicides to the fertilizer for controlling *Rhizoctonia*, spraying and dusting, and comparison of spray fungicides.

**[Plant disease work by the Wisconsin Station].** (Partly coop. U. S. D. A. et al.). (*Wisconsin Sta. Bul. 449 (1940), pp. 20–41, 48, 49, 72–74, figs. 10*).—Reports of progress in plant disease work by staff members and cooperators—A. J. Riker, T. J. Kouba, L. J. Meuli, L. F. Roth, R. Gruenhagen, F. C. McIntire, W. H. Peterson, B. Henry, S. B. Locke, B. M. Duggar, J. Van Lanen, I. L. Baldwin, G. W. Keitt, C. N. Clayton, M. H. Langford, J. C. Walker, E. J. Delwiche, P. and P. G. Smith, M. A. Stahmann, D. Pryor, J. P. Jolivette, J. C. McLean, O. C. Whipple, F. J. LeBeau, T. C. Allen, R. H. Larson, G. H. Rieman, J. Johnson, R. G. and H. L. Shands, and J. G. Dickson—are given on the selection of white pine for blister rust resistance and of poplars for resistance to canker and heart rot; types of pine affected by twig blight; better control of damping-off for tree nurseries; the behavior of crown gall, including the relations of growth factors and "plant hormones" and the pathogenicity of the causal bacteria; the destruc-

tive "boarder tree" or "physiological yellow leaf" of sour cherries, probably a virus disease; eradicant fungicides as an aid in apple scab control; bordeaux again best for cherry leaf spot; treating seed peas beneficial under some conditions; pea breeding stocks show resistance to near-wilt; disease-free canning beans excel in quality; cabbage clubroot control; borax treatment for beet soil; yellows and *Macrosporium* leaf blight as menacing carrot diseases; tomato breeding for *Septoria* and early blight control; spraying for tomato blight diseases; development of better potato sprays and spraying programs; ring rot of potatoes found in Wisconsin; study of the prevalence of potato virus diseases: potato yellow dwarf damage to late crops in 1939; Triumph potatoes free from "sprain"; weather in relation to brown root rot of tobacco; inhibition of tobacco mosaic virus; and the location and testing of barley breeding stocks resistant to scab, stem and leaf rusts, covered, intermediate, and loose smuts, stripe, and mildew.

**A check list of fungi, bacteria, nematodes, and viruses occurring in Hawaii, and their hosts,** G. K. PARRIS. (Hawaii Expt. Sta.). (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1940, Sup. 121, p. 91*).—The two parts of this check list deal, respectively, with the plant hosts listed with the organisms reported on each and the organisms segregated into their respective systematic groups (viz, fungi, bacteria, nematodes, and viruses) with their hosts. Where no host is given the organism has been reported only as saprophytic. The fungi are subdivided into their systematic groups, and separate sections are devoted to those parasitic on insects and on nematodes. The nematodes are subdivided into the plant parasitic and predaceous forms. The literature citations (71 references) are believed to be the original records. The synonyms and corrections in host nomenclature are listed.

**[Papers presented at the Third International Congress for Microbiology, New York, September 2–9, 1939]** (*3. Internatl. Cong. Microbiol., New York, 1939, Rpt. Proc., pp. 43–53, 159, 160, 163, 272, 273, 277–284, 288, 289, 292, 293, 312–322, 441–443, 512–516, 523, 524, 525, 526, 527, 530, 531, 534–536, 544, 546–551, 552–557, 557–561, 563, 707–710*).—The following lecture (pp. 43–53) and abstracts of papers are of interest to plant pathology: Properties of Viruses, by W. M. Stanley (pp. 43–53); The Comparative Morphology of Virus Forms as Primitive Stages in Bacterial Life Cycles [trans. title], by G. Enderlin; The Relationships of the Phytopathogenic Bacteria, by W. H. Burkholder; Wind Dissemination of Plant Pathogens, by E. C. Stakman; Introductory Address [on the Nature and Characteristics of Viruses], by J. H. Smith; Nomenclature and Classification of Phytopathogenic Viruses, by F. O. Holmes; X-ray Evidence on Size and Structure of Plant Virus Preparations, by J. D. Bernal; Some Properties of Purified Preparations of Plant Viruses, by F. C. Bawden and N. W. Pirie; Breakdown of Tobacco Mosaic Virus Protein, by L. F. Martin; Nature and Mechanism of Virus Action, by V. L. Rischkow; The Nature of Viruses, by J. McIntosh; The Essence of the Ultravirus Based on Recent Researches, by J. v. Darányi; The Problem of the Virus and Researches on Bacteriophagy [trans. title], by E. Wollman; Comparative Studies on Ultracentrifugation and Serological Reactions of Bacteriophages, Plant Viruses, and Insect Viruses, by A. Gratia; Comparative Investigations on the Cultivability of Viruses by Different Methods of Tissue Culture [trans. title], by E. Haagen; Viruses and Non-Vector Insects, by K. M. Smith and W. D. MacClement; Studies on the Manner of Insect Transmission of Plant Viruses, by H. H. Storey; Studies on the Relationship Between Insect Vector and Virus With Special Reference to the Insect's Symbionts, by W. Carter; Plant Virus Inhibitors, by J. Johnson; Virus Mutants, by L. O. Kunkel; The "Acquired-Immunity" Test and Its Limitations for Establishing Relationship Between Virus Mutants, and

Nonrelationship Between Distinct Viruses, by H. H. McKinney; Cytological Researches on Tobacco Mosaic, by J. Dufrenoy; The Forms and Types of X-Bodies Formed by Different Viruses Within the Same Host, by F. P. McWhorter; Factors Affecting the Formation of Plate and Needle Crystals in Plant Cells Affected With Tobacco-Mosaic Virus, by H. P. Beale; Virus Diseases of Fruit Trees, by D. Atanasoff; Virus Diseases of Potatoes in Brazil, by K. Silberschmidt; Stripe-A Virus Disease of the Narcissus, by J. Caldwell; Methods Requisite for Proving Virus Diseases in Woody Plants, by L. M. Hutchins; Transmission of Certain Virus Diseases by Patch Grafting or Contact, by G. H. Berkeley; Treatment of Soil for the Control of the Bulb or Stem Nema *Ditylenchus dipsaci*, by B. G. and M. B. Chitwood; Considerations Relative to the Destruction of Larvae of Nematode Parasites by Predatory Hyphomycetes [trans. title], by R. E. A. Deschiens; Variations in Fructifications of Elsinoë, Including Descriptions of New Species, by A. A. Bitancourt; Fruiting Phases of Anthracnose Fungi of the Myrianiales, by A. E. Jenkins; Chytridiaceous Fungi in Relation to Disease in Flowering Plants, With Special Reference to *Physoderma*, by F. K. Sparrow, Jr.; Etiology and Pathogenesis—Plant Kingdom, by G. H. Coons; Tissue Reactions—Plant Kingdom, by J. C. Walker; Natural Resistance, Including Immunity—Plant Kingdom, by E. C. Stakman; Host-Parasite Relations of *Ceratostomella ulmi*, by C. May; The Flexuous Hyphae of *Puccinia graminis* and of Other Rust Fungi, by A. H. R. Buller; The Mechanics of Spermatial and Conidial Fertilization in *Neurospora sitophila*, by M. P. Backus; Variation and Hybridization in *Puccinia graminis*, by M. Newton and T. Johnson; Growth Substances in Relation to Crown Gall, by A. J. Riker; Colchicine in the Inhibition and Death of Plant Tumors, by N. A. Brown; Effects of Animal Hormones and of Vitamins on the Incremental Growth of "Crown Gall," by L. J. Havas; Atypical Growths and Chromosome Alterations in Plants Induced by Micro-organisms, Chemical Substances, and Other Agents and Their Evolutionary Significance, by D. Kostoff; The Role of Dysauxony in the Causal Complex of Galls, by G. K. K. Link; Abnormal Plant Growth Under the Influence of Vitamins, Hormones, and Irradiations [trans. title], by J. v. Ries and F. Ludwig; Chemical Attenuation of Crown Gall Bacteria, by I. L. Baldwin; Pathological Changes in Host Tissue Under the Influence of *Pseudomonas tumefaciens* [trans. title], by C. Stapp and E. Pfeil; Plant Responses to Carcinogenic Agents and Growth Substances—Their Relation to Crown Gall and Cancer, by M. Levine; Spore Dispersal in the Mucoraceae, by C. G. Dobbs; The Control of Loose Smut of Barley (*Ustilago nuda*) and of Wheat (*Ustilago tritici*) by Means of Vacuum Treatment, by C. T. W. Hammarlund; Staining the Vacuolar System of Living Mycelia in Parasitised Tissues, by J. Dufrenoy and G. Ploux; Selective Action in the Symbiosis of Fungus and Crop Plants [trans. title], by T. E. Roemer, K. Isenbeck, and H. Becker; Sugar Tolerant Yeast Causing the Spoilage of Dried Fruits, by E. M. Mrak and E. E. Baker; Comments on the Microbiology of Spoilage in Canned Foods, by E. J. Camerón and J. R. Esty; Action of Acetic Acid on Food Spoilage Microorganisms, by A. S. Levine and C. R. Fellers; and Bacteriological Flora During Spoilage of Frozen Vegetables, by N. H. Sanderson, Jr., and G. A. Fitzgerald.

**[Abstracts of papers]** (*Amer. Chem. Soc. Mtg., 98 (1939), Abs. Papers, pp. 18B, 5E, 6E, 16E*).—The following are of phytopathological interest: Some properties of Purified Plant Virus Preparations, by F. C. Bawden; The Electro-Optical Effect in Tobacco Mosaic and Related Viruses, by M. A. Lauffer; and Thixotropic Tobacco-Mosaic Virus Protein, by V. L. Frampton.

**Symposium on the defense mechanisms in plants and animals** (*Amer. Nat., 74 (1940), No. 751, pp. 107–147, fig. 1*).—The following papers are included: Local Reactions in Plants, by F. W. Went (pp. 107–116); Generalized Defense

Reactions in Plants, by W. C. Price (pp. 117–128); and Local and Generalized Defense Reactions in Animals, by W. Bloom (pp. 129–147).

**Chloropicrin, steam, carbon bisulphide, and other treatments for the control of injurious soil microorganisms,** F. L. Howard. (R. I. Expt. Sta.). (*Ill. State Veg. Growers' Assoc. Ann. Rpt., 9 (1939), pp. 36–42; also in Veg. Growers Assoc. Amer. Ann. Rpt., 1939, pp. 115–130, figs. 5*).—This is a review of the literature and of work on soil disinfection and fumigation. Of the newer chemicals being used, chloropicrin is known to kill both fungi and insects and generally to leave the soil in such condition that plant growth is stimulated. Dichloroethyl ether is definitely insecticidal and at concentrations harmless to plants in some cases. Methyl bromide is a powerful insecticide and is being developed for soil work. It is thus seen that one of the latest developments in soil science and pest and disease control lies in the use of volatile chemicals. By this means it is believed that the roots of plants in partially sterilized soil will be unhampered by injurious and competitive organisms and hence produce more abundant crops.

**Distribution of fungous diseases of crop plants in the Caribbean region,** R. E. D. Baker (*Trop. Agr. [Trinidad], 17 (1940), No. 5, pp. 90–94*).—In this summary of replies to a detailed questionnaire sent out in May 1939, compiled with the aid of the mycologists, agricultural officers, and other scientific workers in the countries concerned, the diseases are listed by crop plants.

**A brief host index of some plant pathogens and virus diseases in eastern Asia,** G. D. Darker (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1940, Sup. 122, pp. 93–123*).—This host list, including algae, fungi, lichens, mosses, ferns, and invertebrates, as well as flowering plants, was compiled on the basis of records which may be traced in the bibliography of Merrill and Walker (E. S. R., 79, p. 608). Localities and dates are given.

**Thermal inactivation rates of four plant viruses,** W. C. Price (*Arch. Gesam. Virusforsch., 1 (1940), No. 3, pp. 373–386, figs. 2*).—Thermal inactivations of tobacco-necrosis virus, tobacco-mosaic virus, alfalfa-mosaic virus, and tobacco ring spot virus followed the course of a first order reaction. The inactivation rates at a number of temperatures were calculated for each. The energy of activation (*E* value) for each was calculated from inactivation rates at different temperatures. The *E* values, in calories per mole, were for tobacco-necrosis virus at 70°–95° C., 37,300; for tobacco-mosaic virus in undiluted juice at 68°–84° and 84°–95°, 55,300 and 195,000, respectively; in juice diluted 1:20 at 68°–83° and 83°–91°, 92,000 and 176,000, respectively; in dried leaf material at 70°–150°, 24,100; for alfalfa-mosaic virus at 50°–62.5°, 75,000; and for tobacco ring spot virus at 45°–56.5° and 56.5°–65°, 78,800 and 27,600, respectively.

**The relationship between viruses of potato calico and alfalfa mosaic,** L. M. Black and W. C. Price (*Phytopathology, 30 (1940), No. 6, pp. 444–447, fig. 1*).—These two viruses produced similar but not identical symptoms on several host plants selected for their distinctive reactions to these viruses, viz, *Nicotiana glutinosa*, *Vicia faba*, *Trifolium incarnatum*, *T. pratense*, *T. repens*, cucumber, bean, potato, and cowpea. Tobacco and *N. glutinosa* plants infected with potato-calico virus proved refractory to infection with alfalfa-mosaic virus, and these viruses are therefore considered to be closely related. Potato-calico virus is named *Marmor medicaginis solani* n. var. and alfalfa-mosaic virus *M. medicaginis typicum* n. var. Since plants infected with potato ring spot virus (*M. dubium annulus*), cucumber-mosaic virus (*M. cucumeris vulgare*) or Canada-streak virus (*M. aucuba canadense* n. var.) are susceptible to alfalfa mosaic, these viruses are not thought to be closely related to alfalfa-mosaic virus.

**Cucumber-mosaic (Cucumis virus 1 of Smith, 1937),** E. E. Chamberlain (*New Zeal. Jour. Sci. and Technol., 21 (1939), No. 2A, pp. 73A–90A, figs. 7*).—This is a review of the literature on the disease (39 references), and a discussion of observations and experiments in New Zealand, with particular reference to insect vectors and the experimental host range. Transmission was obtained by *Aphis gossypii, Myzus persicae*, and *Macrosiphum solani*, and in the seed of marrow. As a result of greenhouse tests the disease was carried to 26 plant species of 16 genera and 7 families. This mosaic was first noted in New Zealand in 1931 and is now known in a number of localities. It has been found spontaneous on cucumber, marrow, pumpkin, rock melon, tomato, and polyanthus, and has caused serious losses in cucumber and rock melon, and in certain localities in tomato. Tentative recommendations for control are offered.

**A new Cercospora from Oklahoma,** W. W. Ray (*Mycologia, 32 (1940), No. 2, p. 271*).—*C. laburni* n. sp., causing a serious leaf spot of the leguminous host *Laburnum anagyroides*, is described.

**Fungi associated with tree cankers in Iowa.—II, Diaporthe, Apioporthe, Cryptodiaporthe, Pseudovalsa, and their related conidial forms,** J. C. Gilman and G. L. McNew. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 14 (1940), No. 2, pp. 129–153, figs. 102*).—Since the preliminary survey (E. S. R., 75, p. 507), more intensive study has been made on some of the collections, and the genus *Diaporthe*, with related genera *Apioporthe, Cryptodiaporthe*, and *Pseudovalsa*, have been reinvestigated in the light of more recent work. All species of these three genera which have been found in the State are reported, together with the species of the form genera *Phomopsis* and *Coryneum*, which are associated with *Diaporthe* and *Pseudovalsa* as conidial stages. A key to the Iowa species of these genera precedes the descriptive and taxonomic text. There are 22 references.

**Cultural and genetic studies on Ustilago zeae,** C. G. Schmitt. (Univ. Mo.). (*Phytopathology, 30 (1940), No. 5, pp. 381–390*).—The methods used for single-spore isolation and inbreeding are described. On Czapek agar spores germinated in 12–24 hr. at 25°–30° C., but at lower temperature germination was delayed and atypical. With monochromatic ultraviolet irradiation, spores exhibited delayed germination and the lag period lengthened with increasing dosages. Chlamydospores exhibited a high percentage of germination immediately after harvesting. With meristematic tissue present and temperature favorable, plants of all ages proved susceptible to *U. zeae*. Below 21° no infection occurred with compatible lines in the greenhouse, but there was anthocyanin formation. Above 27° infection was obtained. Culture media exerted a profound influence on colony appearance and mutation rate. Cultures on Difco corn meal agar gave rise to fewer mutations than did those on more nutritive media. Czapek agar was used for stock cultures. The measures used to prevent mutation in stock cultures included incubation below 18° on a medium low in available nutrients with frequent transfers. Mutations were not induced by ultraviolet or X-ray irradiation or by brief exposure of sporidia to heat near the thermal death point. Increasing the incubation temperature within limits increased the frequency of mutation, but below 20° few if any mutations were noted. For the lines studied, 37.5° proved to be above the maximum. The mutation frequency was not affected by inbreeding for 10 generations. Attempts to induce chlamydospore formation in culture were unsuccessful. Stocks exhibiting the characteristic mycelial type of growth, sporidial type of growth, and beige and cream color were established, the first two in the parental generation and inbred as far as the seventh and tenth generations, respectively. Beige and cream color lines were established in the eighth inbred generation, and the former was inbred to the tenth generation.

The mutation rate of sporidial lines was about three times that of mycelial lines. Segregation of factors for color, sex, and growth type occurred in both I and II of the reduction divisions. Three monosporidial lines out of some 4,000 were monopathogenic. Spores from galls resulting from inoculation with one of these lines failed to give rise to monopathogenic lines. There are 28 references.

**A preliminary report on variability and inheritance in Venturia inaequalis**, G. W. Keitt and M. H. Langford. (Univ. Wis.). (*Phytopathology, 30 (1940), No. 5, pp. 452, 453*).—Monascosporic isolates exhibited distinctive and comparatively constant cultural and pathogenic characters. Segregation for sexual compatibility occurred alternatively in the first and second nuclear division of the ascus. The third division was equatorial. Breeding tests in vitro indicated that certain sectors differed in genetic constitution from the parent isolates.

**Heterothallism in Venturia pirina**, M. H. Langford and G. W. Keitt. (Univ. Wis.). (*Phytopathology, 30 (1940), No. 5, p. 452*).—Monascosporic isolates were found to be hemaphroditic, self-sterile, and selectively cross-fertile. Segregation for sexual compatibility occurred alternatively in the first and second nuclear division of the ascus.

**Micro-element studies with special reference to the element boron**, W. Ferguson and L. E. Wright (*Sci. Agr., 20 (1940), No. 8, pp. 470–487, figs. 11*).—The evidence is said to indicate that boron deficiency causes disturbances affecting the cell structure and interfering with translocation. Turnips lacking B in early stages developed larger and healthier roots than those lacking it during later growth stages. Analysis of plants receiving 1.5 p. p. m. of B showed the highest concentration in the leaves, less in the roots, and least in the leaf stalks, whereas in plants receiving none the B tended to reach a common level in all these organs. It is deemed possible that young leaves, at least for a time, can draw on the B stored in other plant parts. Low- and high-B fed tomato plants produced fruits showing high irregular respiration rates associated with poor keeping qualities. B sprayed on the foliage of turnips and apples was absorbed and utilized. Including borax or boric acid in two of the regular sprays for apples proved one of the most efficient means to raise the B content of the fruit for preventing cork and drought spot. Lime added to orchard plats was accompanied by an increase in these two troubles. The higher B content of soil from the limed plats appeared to indicate a fixation of B. Analysis of six soil types showed a relationship between the amount of water-soluble B and the amount of cork developed on each soil type. It is estimated that an acre of productive apple orchard requires 44–90 gm. of B or 14–28 oz. of borax annually. The effect of lime on the B content of the soil is uncertain, but experimental evidence indicates three possibilities, which are discussed. Some symptoms of B deficiency and excess are described for such crops as turnip, cauliflower, celery, tomato, apple, chrysanthemum, cabbage, and corn. Mn is necessary for normal growth and development of many plants, but a small excess was noted to affect the foliage and yield of tomatoes. Additions in very small amounts of Cu, Zn, U, and Sr were accompanied by reduced yields of fruits from tomato plants. There are 31 references.

**Notes on Alaskan rust fungi**, J. P. Anderson (*Bul. Torrey Bot. Club. 67 (1940), No. 5, pp. 413–416*).—The author reports two species of rust fungi (*Puccinia*) as new to North America, 22 as not before known in Alaska, and 19 as occurring on 28 host species not previously known to be infected in the territory. In addition, the known range of 13 species has been extended.

**Studies in cereal diseases.—XII, Stem rust of cereals**, J. H. CRAIGIE (*Canada Dept. Agr. Pub. 666 (1940), pp. 39, figs. 26*).—A comprehensive summary (57 references) of information on stem rust (*Puccinia graminis*), including its history, life cycle, physiologic specialization, hybridization, infection sources, influence of weather conditions, relation of spore abundance to epidemics, characteristics of spread, spread in North America, effect on cereal plants, and control.

**The physiologic races of Puccinia graminis tritici in Italian East Africa** [trans. title], C. SIBILIA (*Bol. R. Staz. Patol. Veg.* [*Roma*], *n. ser., 19 (1939), No. 4, pp. 497–508, pl. 1*).

***Cercosporella* foot rot of winter grains in the Pacific Northwest**, R. SPRAGUE. (Coop. Idaho, Oreg., and Wash. Expt. Stas.). (*U. S. Dept. Agr., Bur. Plant Indus., 1939, pp. 13*).—The foot rot due to *C. herpotrichoides* occurs in certain areas of Idaho, Oregon, and Washington, chiefly in high prairie regions with fine sandy loam or silt loam soils, causing heavy losses in badly infested fields. The fungus overwinters in the soil, and unusually favorable growing weather in the fall, winter, and early spring, followed by less favorable weather later, tends to favor its development. Control is difficult, but in badly infested fields crop rotation, including (where practicable) spring wheat, which is not attacked, or the resistant Olympia winter barley, is said to be the most feasible measure. Varietal ratings as to relative susceptibility, and wheats recommended for particular communities where foot rot is prevalent, are listed.

**Control of smut diseases in Egypt, with special reference to sowing depth and soil moisture**, G. H. JONES and ABD EL-GHANI SEIF EL-NASR EFF. (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 224 (1940), pp. IV+46, pls. 7, figs. 10*).—Irregular results in seed disinfection tests with barley covered smut and wheat flag smut were traced to differences in planting methods. In the flag smut the difference was due partly to differences of planting depth and partly to those of soil moisture. In the covered smut the effects were more pronounced, but it was found that seed disinfection with sulfur was successful regardless of planting method. Similar effects of the planting method were found for wheat bunt and millet and broomcorn smuts. The influence of depth is discussed for each disease, and it is concluded that it was due to unsuitable conditions for infection in shallow plantings and to a lengthened susceptible stage in the deeper plantings. On the other hand, high soil moisture constantly reduced the disease and increasingly so with depth, apparently due to poor aeration. Smut control by special planting methods is discussed in relation to control by seed disinfection and selection of resistant varieties. Appendixes discuss the distribution, losses, and control of flag smut in Egypt, and describe the behavior of dehulled barley seedlings from the standpoint of pathology.

**Losses from bunt of wheat in the United States**, N. E. STEVENS. (Univ. Ill.). (*Phytopathology, 30 (1940), No. 5, pp. 449–451, fig. 1*).—Comparisons of the estimated losses from wheat bunt (1917–37) with the percentages of all cars grading smutty, as indicated in reports of Federal grain inspectors (1928–37), are reported to have shown a decline in the abundance of this disease during recent years. The same sources of information afforded a means of checking the relative smut-induced losses in wheat and rye, and these data are also tabulated.

**Effects of soil type, soil sterilization, and soil reaction on bunt infection at different incubation temperatures**, H. A. RODENHISER and J. W. TAYLOR. (U. S. D. A.). (*Phytopathology, 30 (1940), No. 5, pp. 400–408, figs. 2*).—From the results obtained with *Tilletia levis* (race L-2) it appears evident that infection in a susceptible wheat variety is affected by soil type. Furthermore, the

degree to which it is influenced depends on the soil temperature during the time in which infection may occur. When both Marquis and Thatcher seedlings from large seeds were incubated at 10° and 15° C., there was no appreciable difference in the amount of infection in Hempstead and Mendon loams, but at 5° Marquis developed 33 and Thatcher 42.2 percent more bunt in Mendon than in Hempstead loam. Similar conclusions were drawn from tests on other soil types.

Generalizations could not be drawn regarding the effect of soil sterilization on bunt infection, as shown by detailed analysis of the results obtained. The tests on soil reaction were not extensive enough to answer all questions, but they indicated that change in pH may cause a change in the degree of bunt infection in Marquis wheat when germinated and incubated in either Chester loam or Keyport clay loam. It was evident that the degree to which pH affects bunt infection varies with the soil type and incubation temperatures. There was a trend toward higher percentages of bunt infection when small seeds were used as compared with large, and the seed-size factor may therefore be considered a minor factor in the response of a variety to bunt. Soil type and certain incubation temperatures were the major factors, and the studies here reported emphasize the importance of their interrelation. Variations in their interrelationships may account for the seasonal differences in response of a variety to a race of bunt and for differences when tested at different places.

**Leaf reddening in oats in Oregon,** R. Sprague. (Coop. U. S. D. A.). (*Oregon Sta. Cir. Inform. 208 (1939), pp. 3*).—The causes of this condition are said to be many, but most cases in Oregon are accounted for by heavy rains in winter or rarely in spring, high soil acidity, cold injury to chlorophyll, excessive top growth, soil-borne root and foot rots, leather leaf due to *Pseudodiscosia avenae*, minor leaf spots, and insect injuries. Suggested control measures are given.

**Reports on research for 1939: Plant pathology,** G. M. Reed (*Brooklyn Bot. Gard. Rec., 29 (1940), No. 2, pp. 51–56, fig. 1*).—Notes on studies of the inheritance of resistance of oat hybrids to loose and covered smuts, physiologic races of the oat smuts, methods of inoculation of oat smuts, experimentally produced physiologic races of oat smuts, and sorghum smut are given.

**The bacterial wilt of the abacá (Manila hemp) plant in Davao.—I, Nature of the disease and pathogenicity tests,** M. A. Palo and M. R. Calinisan (*Philippine Jour. Agr., 10 (1939), No. 4, pp. 373–395, pls. 15*).—This disease is said to be considered the most serious of all Manila hemp maladies found in Davao, Mindanao. Its distribution and economic importance are discussed in detail, and the symptoms and associated organisms are described. The microorganism found by various inoculation tests to be the cause was a *Bacterium* resembling *B.* (= *Phytomonas*) *solanacearum*.

**Hydroxyl-ion concentration of the saliva of partly desiccated beet leaf hoppers,** J. M. Fife. (U. S. D. A.). (*Phytopathology, 30 (1940), No. 5, pp. 433–437, fig. 1*).—When starved sugar beet leafhoppers (*Eutettix tenellus*) were fed on small drops of a 2-percent solution of sucrose slightly buffered at pH 3.07 the pH of the solution was increased, indicating that hydroxyl ions had been injected into the drop. By calculating the equivalents of hydroxyl ions injected into each drop from the increase in pH and the buffer curve of the solution, it is shown that if the number of equivalents of hydroxyl ions injected into the drops of the solution were injected into 0.01 cc. of water its pH would be greater than 10. Measurements and calculations proved that the pH of normal leafhoppers' saliva is greater than 10 and may reach ±11 in the saliva of starved leafhoppers.

**Borax for the control of internal black spot of beets,** J. C. WALKER (*Canner, 90 (1940), No. 15, p. 31*).—An abstract.

**Internal grain infection and kernel rot in the 1938 American maize crop,** E. T. EDWARDS (*Jour. Austral. Inst. Agr. Sci., 6 (1940), No. 1, pp. 25–31*).—A review of the literature and survey, with particular reference to the relation between internal grain infection and the nature and incidence of kernel rot.

**A study of the pathogenic action of Phymatotrichum omnivorum,** G. M. and M. O. WATKINS. (Tex. Expt. Sta. coop. U. S. D. A.). (*Amer. Jour. Bot., 27 (1940), No. 4, pp. 251–262, figs. 54*).—Portions of the expressed juices from roots of cotton seedlings thoroughly rotted by *P. omnivorum* mycelium, and also from the sclerotia of the fungus, were applied as drops directly on the surfaces of healthy seedling roots of cotton, retama (*Parkinsonia aculeata*), and corn. Similar portions were heated to the boiling point for 1 hr. and, when cool, applied to the roots of other seedlings of these same species. In the roots of all three species tested, the unheated fluid from each source caused swelling, distortion, and increased capacity to retain dyes in the walls of exposed cells, followed by collapse of the involved tissues into a dark-staining layer of disorganized cells. The heated fluid induced no appreciable changes in the cell walls, but caused considerable disorganization of the protoplasts. It is concluded that exudates from the mycelium contain thermolabile substances, probably enzymes, which are largely responsible for the destruction of host cell walls during infection by this fungus.

**Potash helps cotton resist wilt, rust, and drought,** P. A. YOUNG. (Tex. Expt. Sta.). (*Better Crops With Plant Food, 24 (1940), No. 4, pp. 6, 7, 42, 43, figs. 3*).—*Fusarium vasinfectum* wilt and rust (potash hunger) are said to cause large annual losses to cotton on sandy soils of eastern Texas. Experiments and observations on commercial fields indicated that potash greatly reduces these troubles. On the average, 24 lb. of potash per acre increased the yield of susceptible varieties 38 percent and of resistant varieties 28 percent, with greater increases for 48 lb. per acre.

**Report of the committee to coordinate research on new and unusual potato diseases,** J. G. LEACH ET AL. (*Amer. Potato Jour., 17 (1940), No. 4, pp. 81–88, fig. 1*).—This report, presented at the annual meeting of the Potato Association of America (December 1939), deals with the bacterial ring rot of potato caused by *Phytomonas sepedonica* and includes recommendations.

**The distribution of Phytomonas sepedonica in potato seed-pieces, plants, and tubers, and its significance,** F. W. HAASIS (*Calif. Dept. Agr. Bul., 29 (1940), No. 1, pp. 16–20, figs. 4*).—It was shown by staining reactions that the *P. sepedonica* population may vary markedly in different parts of a potato plant or of a single tuber, the general tendency being toward a gradient from larger numbers near the seed piece to smaller numbers in the upper part of the plant and from larger numbers near the stem end of the tuber to smaller ones near the crown end. This distribution appears to be a corollary of the general restriction of the bacteria to the vascular region of the living plant parts. Wilting in the field is believed due to clogging of the conductive elements by the bacteria, a considerable time evidently being necessary to build up a sufficiently large population to cause this condition. Diversities in bacterial population as between individual tubers are presumed to be correlated with differences in their numbers in the seed pieces and resulting vines.

**Further studies of potato viruses of the Y-group** [trans. title], E. KÖHLER (*Phytopathol. Ztschr., 12 (1940), No. 5, pp. 480–489, figs. 4*).—On the basis of the symptom complex the author agrees with Murphy, Bawden, Dykstra, and others that the A-virus is closely related to the Y-virus. On the other hand, he believes that the former exhibits characteristics which justify conceiving it to be

an independent virus. The present study of four strains of the Y-virus and two of the A-virus indicated differences in the following essential points: *Nicotiana glutinosa* and *Solanum racemigerum* proved susceptible to the Y-strains but immune to the A-strains. The thermal inactivation point at 10 minutes' duration was ±58° C. for the Y-strains and ±50° for the A-strains. Infection with the A-virus protected the plants against infections with the Y-strains, and the reverse was also true. However, infection with a weak Y-strain offered protection against infection with more virulent strains of the same virus. Furthermore, according to the findings of others, there are also serological differences between Y- and A-viruses.

**Identity of the Bacterium causing potato blackleg,** W. J. DOWSON (*Nature [London], 145 (1940), No. 3668, p. 263*).—This is a taxonomic review (10 references) from which the author concludes that blackleg is due to *B. phytophthorum,* which also induces a soft rot in potato tubers and other plant tissues. Another distinct organism, *B. carotovorum*, produces similar rots in tubers, etc., but not blackleg of potato stems. The former is said to produce acid on maltose, while the latter does not.

**The copper content of Long Island soils in relation to tuber rot of potatoes caused by Phytophthora infestans (Mont.) duBary,** J. B. SKAPTASON, L. C. PETERSON, and F. M. BLODGETT. (Cornell Univ.). (*Amer. Potato Jour., 17 (1940), No. 4, pp. 88–92*).—Although conditions favorable to epidemics of potato late blight occur in this area every year, *Phytophthora* rot of the tubers has been negligible. Believing that accumulations of copper in the soil from long continued bordeaux spraying might be sufficient to inhibit development of the fungus there, an old potato soil and a virgin soil were analyzed for copper content and tested for effects on *Phytophthora* sporangial germination. The preliminary results reported are suggestive that accumulated copper may be an important factor in accounting for this apparent lack of tuber rot in fields where the foliage has become severely infected or destroyed by the disease.

**Potato breeding for Fusarium resistance,** W. C. EDMUNDSON and L. A. SCHAAL. (U. S. D. A.). (*Amer. Potato Jour., 17 (1940), No. 4, pp. 92–95, fig. 1*).—As a result of 10 yr. of potato work at Greeley, Colo., during which time breeding for *Fusarium* resistance has been one of the principal problems, and with 150 or more seedling varieties included in the tests each year, it is concluded that it may be possible to develop commercial varieties with a high degree of resistance in the field to *Fusarium* species.

**The influence of various sources of nitrogen on potato yields and potato scab,** R. H. DAINES and W. H. MARTIN. (Coop. U. S. D. A.). (*N. J. State Potato Assoc., Hints to Potato Growers, 20 (1940), No. 11, pp. [1–6]*).—In the 3-yr. tests reported, the plats treated with fertilizers containing N from a combination of organic and inorganic forms and those in which the N used consisted of two units each of $NaNO_3$ and $(NH_4)_2SO_4$ produced the highest yields. There seemed to be no correlation between yields and reaction except when $NaNO_3$ supplied all the N, in which case the alkaline mixture outyielded the acid combination in three of four tests. In the only test with sufficient scabby potatoes for obtaining data, the plats receiving N as $NaNO_3$ alone produced a higher percentage of scabby potatoes, and these more severely affected, than any of the others. This was true whether the fertilizer was slightly alkaline or made potentially acid by adding S. Where the mixture containing $NaNO_3$ was made slightly acid by $(NH_4)_2SO_4$, however, this tendency to produce excessive scab appeared to be more effectively overcome. All the remaining N plats proved to be about equal in the amount of scab.

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**[Papers on sugar beet pathology]** (*Amer. Soc. Sugar Beet Technol. Proc., 1 (1938), pp. 57–72*).—This report "contains results, summaries, and conclusions from a vast range of experimental projects." The following are of particular interest to plant pathology: *Cercospora* Control by Spray and Dust, by H. D. Brown (pp. 57–59); Root-Rots of the Sugar Beet, by A. C. Maxson (pp. 60–64); Effect of Downy Mildew on Size, Sucrose Percentage, and Purity of Sugar Beets, by L. D. Leach (pp. 64–66) (Univ. Calif.); Studies on Curly Top Epidemiology in Sugar Beet Fields, by A. M. Murphy (p. 67), A General Discussion of the Beet Leafhopper, by W. C. Cook (pp. 67–69), and Plant Ecology in Relation to the Curly Top Disease, by R. L. Piemeisel (p. 69) (all U. S. D. A.); Experiments for the Control of the Beet Leafhopper in Idaho, 1936–37, by J. R. Douglass and J. A. Gillett (pp. 69–71) (U. S. D. A. and Idaho Expt. Sta.); and Varietal Tests for Resistance to Sugar Beet Nematodes, by F. V. Owen, G. Thorne, and C. W. McBeth (p. 71), Alfalfa Resistant to the Stem Nematode, by G. Thorne (pp. 71, 72), and The Inheritance of Curly-Top Resistance in Beets, by F. A. Abegg (p. 72) (all U. S. D. A.).

**Sweetclover, a probable host of tobacco streak virus,** W. D. VALLEAU. (Ky. Expt. Sta.). (*Phytopathology, 30 (1940), No. 5, pp. 438–440*).—In Kentucky, streak is usually found in tobacco growing near sporadic sweetclover (*Melilotus alba*) plants, appearing about the time seed is forming. Undisturbed mixed plantings of 1- and 2-yr. sweetclover are apparently not dangerous for tobacco, probably because in such cases the insect vector is not forced to migrate.

**Control of blackfire of tobacco in western Kentucky,** E. M. JOHNSON and W. D. VALLEAU (*Kentucky Sta. Bul. 399 (1940), pp. 17–39, figs. 7*).—This late-season disease, due to either *Bacterium tabacum* (=*Phytomonas tabaci*) or *B. angulatum* (=*P. angulata*), together with wet weather and unsatisfactory soil conditions, is reported to cause annual losses of dark tobaccos and in seasons of heavy rainfall to destroy many crops. Infections by these organisms on young, actively growing plants are readily distinguishable as wildfire and angular leaf spot, respectively. The symptoms of all three types of disease are described. Wildfire or angular leaf spot develop in the field soon after setting if either have been present in the bed, and if rains are frequent or heavy, damage from blackfire develops rapidly in such fields. Blackfire causes greater damage on soils of low fertility. In western Kentucky, where the disease causes heavy damage, tests indicated that more than 80 percent of the fields were too low in P and K for satisfactory tobacco growth. This condition, especially as to K, increases the susceptibility of plants to injury. Using a rotation with two to several years of a grass-legume mixture, not too heavily pastured, and generous application of manure and fertilizers, dark tobacco could be topped at 16–20 instead of 10–12 leaves, with expectation of increased yields of high-quality tobacco relatively free from blackfire. Well-rotted stable manure often prevented damage from blackfire. Observations and experiments indicated that a combination of bordeaux treatment of plant beds and the best soil practices must be followed if high yields of relatively disease-free, high-quality tobacco are to be obtained.

**Diseases and decays of Connecticut tobacco,** P. J. ANDERSON (*Connecticut [New Haven] Sta. Bul. 432 (1940), pp. 89–161, figs. 35*).—This is a handbook dealing with the infections and physiological diseases occurring in the seedbed, in both seedbed and field, root diseases, stalk diseases in the field, leaf diseases in the field, decays and disorders during curing, and decay and mold of fermenting or stored tobacco. An appendix takes up sterilization of soil in the seedbed, preparation of bordeaux mixture for spraying seedbeds, and curing with the aid of charcoal fires.

**The inheritance of immunity from mildew (Bremia lactucae) in lettuce,** I. C. JAGGER and T. W. WHITAKER. (U. S. D. A.). (*Phytopathology, 30 (1940), No. 5, pp. 427–433*).—The occurrence of at least five physiologic races of *B. lactucae* has been recorded, and the inheritance of immunity to one of them is here described in detail. Immunity proved dependent on a single dominant gene. Dominant genes for immunity were found only in the more primitive types of lettuce, and evidence is presented that these types came from near the point of origin of cultivated lettuce. There was no indication of linkage between genes for immunity and those governing the various morphological characters. Indirect evidence indicated that physiologic races in this fungus originate through mutation.

**Onion eelworm rot or bloat caused by the stem or bulb nematode, Ditylenchus dipsaci,** A. G. NEWHALL and B. G. CHITWOOD (*Phytopathology, 30 (1940), No. 5, pp. 390–400, figs. 4*).—Definite records of outbreaks of this nematode on growing onions in North America are said to be confined to New York State, but there are indications that this disease may exist in other places. On onion seedlings stunting, distortion, temporary decolorization, and hypertrophy are characteristic. On growing bulbs a softening of outer scales accompanied by frostlike, odorless mealiness of the parenchyma tissue is fairly diagnostic. Without rotation the disease may reduce yields to almost nothing. Eradication by steam sterilization on one-third of an acre of muckland at a cost of $230 has been reported, but use of sulfur or chloropicrin as more economical soil treatments has shown some promise in preliminary tests.

**Noninfectious hairy root,** E. A. SIEGLER. (U. S. D. A.). (*Amer. Nurseryman, 71 (1940), No. 3, p. 7, figs. 4*).—The author draws distinctions between the noninfectious (or hereditary) type of hairy root and woolly knot or hairy root. He cautions against using seedlings with the noninfectious type in the usual propagation routine, since unsightly malformations result on the 1- and 2-yr. trees and necessitate discarding them.

**The boron-deficiency disease of apple,** A. B. BURRELL (*N. Y. State Col. Agr., Cornell Ext. Bul. 428 (1940), pp. 28, figs. 13*).—In this compendium of information on the boron deficiency disease of apple, which has been known under such names as cork, punk, woody apple, etc., the symptoms in fruit and vegetative organs are described and compared with certain other diseases. The behavior of different varieties; the nature and amount of losses involved; the influence of environal factors, tree condition, and cultural practices; and control measures are discussed in detail. Extensive experiments indicated that treatments with boron compounds will control the disease. In New York State such treatments seem beneficial only in preventing the specific symptoms here described and therefore are recommended only for orchards exhibiting these symptoms. The Cornell experiments included application by soil, spray, and injection. Of these methods, soil application seemed best adapted to general commercial use in New York, although spraying may occasionally prove useful under special circumstances.

**Control of internal cork of apples by boron applications,** J. R. MAGNESS. (U. S. D. A.). (*Pa. State Hort. Assoc. News, 17 (1940), No. 1, pp. 74, 75, 77–80, 82, fig. 1*).—Experimental results in 1936 and 1937 indicated that either boric acid or borax applied to the soil in the fall or spring up to 3 weeks before bloom will almost completely prevent the development of internal cork. The necessity of distinguishing between this trouble and such diseases as bitter pit is emphasized, if boron is to be used intelligently.

**Effectiveness of some sulphur sprays for control of apple scab,** R. C. BAINES and G. E. MARSHALL. (Ind. Expt. Sta.). (*Ind. Hort. Soc. Trans., 1939, pp. 73, 74*).—A brief summary of 1939 tests.

**The effectiveness of eradicant sprays in control of apple scab in Indiana in 1939,** R. C. BAINES. (Ind. Expt. Sta.). (*Ind. Hort. Soc. Trans., 1939, pp. 74–77*).—A brief summary of tests, showing that eradicant fungicidal sprays very significantly reduced primary infection and encouraging the hope that their use may be of real value in securing adequate control during seasons when inoculum is abundant and weather conditions are especially favorable for scab development.

**Apple scab control with mild sulfur sprays,** H. F. WINTER and H. C. YOUNG. (Ohio Expt. Sta.). (*Ohio State Hort. Soc. Proc., 73 (1940), pp. 40–43*).—From the latest experimental results and on the basis of effective control with minimum spray injury, liquid lime-sulfur is recommended for the delayed dormant and prepink sprays, and flotation sulfur paste for the pink, calyx, 2 weeks, and all other sprays needed. The improvement of all types of wettable sulfurs is noted.

**Report of conference on fire blight of apples and pears** (*U. S. Dept. Agr., Ext. Path. No. 41 (1940), pp. 13–30*).—The report includes a paper on the Epidemiology of Fire Blight of Apples and Pears, by G. W. Keitt (Univ. Wis.); remarks by L. Shaw and by E. M. Hildebrand; and discussion by various members of the conference.

**The role of fixed coppers in stone fruit spraying,** H. C. YOUNG and H. F. WINTER. (Ohio Expt. Sta.). (*Ohio State Hort. Soc. Proc., 73 (1940), pp. 101–107*).—A brief summary of 3 years' tests (1937–39) indicated no serious injury on sweet or sour cherries, or on plums, and good control of leaf spot. For brown rot control, flotation sulfur paste is recommended for the preharvest application. The fixed copper materials are not recommended for peaches, none of them having been found safe for use on the foliage.

**Gum-spot disease of stone fruits,** A. J. LOUW (*Farming in So. Africa, 15 (1940), No. 168, pp. 105–108, 128, figs. 8*).—Though previously recorded for South Africa, the disease due to *Coryneum beijerinckii* had apparently caused no serious damage until the last two seasons, when it assumed epidemic proportions on apricots and peaches in several places. A general discussion of the disease and its control under the local conditions is given.

**Brown-spotting of apricots, a boron-deficiency disease,** H. O. ASKEW and W. R. L. WILLIAMS (*New Zeal. Jour. Sci. and Technol., 21 (1939), No. 2A, pp. 103A–106A, fig. 1*).—"A browning of the flesh of apricots, more particularly in the stem end of the fruit, has been shown to be due to boron deficiency. This ailment may be controlled by the use of hydrated borax either as a soil top-dressing or as a spray. The marked increase in boron content of the fruit following borax treatment is correlated positively with freedom from browning of the flesh."

**Crown gall of peach in the nursery,** E. A. SIEGLER and J. J. BOWMAN. (U. S. D. A.). (*Phytopathology, 30 (1940), No. 5, pp. 417–426, figs. 2*).—Infection with *Phytomonas tumefaciens* is said to be very prevalent where it is the practice to plant peach seeds after they have sprouted, this undoubtedly resulting in more severe injury than when the pits are planted in the fall and allowed to germinate in place. The prevalence of the crown gall organism in regions known to have alkaline soils, together with the fact that a large percentage of infections on 1-yr. peach trees occur near the root-stem junction, led to experiments in artificially infested soil. In these tests peach pits (1) were planted in acid and alkaline soils and (2) were dipped in a suspension of calomel 4 oz. to 1 gal. of water) before planting. Examination at the end of the growing season indicated in acid soil (pH 5.8) 9 percent galled trees, and in alkaline soil (pH 8.5) 59 percent galled trees; with calomel-treated pits 6 percent galled

trees, and with nontreated pits 71 percent galled trees. All galls occurred on the main axis, showing that soil infestation had been confined to an area close to the pits. Certain other treatments gave inconsistent results.

**A preliminary report on little-leaf of the peach in Florida—a zinc deficiency,** R. D. Dickey and G. H. Blackmon (*Florida Sta. Bul. 344 (1940), pp. 19, figs. 8*).—This disorder as it occurs in Florida was corrected by soil or spray applications of $ZnCO_4$, while no response followed the use of $MnSO_4$ or $MgSO_4$ alone or in combination. The symptoms of this Zn deficiency disease are described. It is said to occur over a wide area in the State and to have been observed in orchard trees and seedlings about homes in many locations. There are 16 references.

**Diaporthe vaccinii, the ascigerous stage of Phomopsis, causing a twig blight of blueberry,** M. S. Wilcox. (U. S. D. A.). (*Phytopathology, 30 (1940), No. 5, pp. 441–443, figs. 2*).—The author reports the development in culture of the perfect stage of the blueberry twig-blight fungus *P. vaccinii* and its identity with *D. vaccinii*.

**Blossom "blast" of cranberries,** R. B. Wilcox. (U. S. D. A.). (*Amer. Cranberry Growers' Assoc., Proc. Ann. Mtg., 70 (1940), pp. 14–22*).—"Physiological blast" is said to be especially noticeable in New Jersey after a heavy crop year or a season of excessive rainfall throughout the late summer, and to be less serious after the vines have borne a light crop or none, as when the winter flood has been held until July. Sudden, severe cold before flooding in the fall, or a severe frost on exposed vines before spring expansion of the flower buds may also render them incapable of producing fruit. Deficient pollination can seldom be held responsible for a short crop in the State. Fungus blast is said to be best controlled by a bordeaux and rosin-fish-oil spray just before blooming. Other spray combinations are also noted. Low temperature during the blossom period is not to be feared if no part of the bog is allowed to freeze, but excessively high air temperatures during this period may be followed by heavy blast. June reflows are particularly hazardous during hot weather, but will injure the buds at any time if the oxygen content of the water is too low. Prolonged hot periods in spring before removal of the winter flood have reduced New Jersey crops, presumably by injuring the submerged, dormant buds. *Holding the water late during an excessively warm spring should be avoided* where possible. When changing from late to early drawing, especial attention should be directed to spring frosts and to the possibility of an increase in fungus blast and rot.

**Chlorosis of Concord grapes controlled by grafting: The grafting of Concord scions on vinifera rootstocks produces a vine that is resistant to chlorosis,** F. B. Wann (*Farm and Home Sci. [Utah Sta.], 1 (1940), No. 1, pp. 9, 11, fig. 1*).—This abnormality is said to occur usually in localized areas where soil conditions prevent the proper utilization of iron. In selecting cuttings it appeared that general vigor and productiveness were not necessarily passed on, but that these resulted largely from proper rooting of the cuttings and cultural care. Variety tests showed that all the labrusca varieties and hybrids were more or less subject to chlorosis but that the vinifera varieties were green and vigorous under the same conditions, suggesting the possibility of using the latter as rootstocks for Concord scions in chlorosis areas. The vinifera varieties successfully thus used included Tokay, Muscat, Malaga, Black Prince, and Rose of Peru.

**Experiments for the control of fruit spots of the avocado,** G. D. Ruehle. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc., 52 (1939), pp. 73–78*).—Cuprous oxide and tribasic copper sulfate are reported to have given effective control of

fruit spots (*Cercospora* sp. and *Colletotrichum gloeosporioides*) when substituted for bordeaux mixture. It is also believed that proprietary neutral copper sprays with good fungicidal properties would give similar results. None of these materials requires added lime, and the saving in time and labor of preparation and the gain in uniformity are noted. They also deposit less residue and promote scale increase less than bordeaux sprays. Addition of wettable sulfur to the copper sprays does not effectively suppress *Dictyospermum* scale, but appears a valuable adjunct for red spider control. Fruit spots are said to be more difficult of control in trees lacking in vigor.

**Transmission of "swollen shoot" disease of cacao,** A. F. Posnette (*Trop. Agr.* [*Trinidad*], *17* (*1940*), *No. 5, p. 98*).—Transmission of the disease by budding under insect-proof cages as reported suggests that the cause is a virus. Its spread on native farms on the Gold Coast is noted.

**The influence of climatic factors on citrus scab disease,** R. E. D. Baker (*Trop. Agr.* [*Trinidad*], *17* (*1940*), *No. 5, pp. 83–86*).—The climatic factors influencing infection by *Elsinoë citri* are contrasted for Florida and Trinidad, and a tabulation is presented of the number of days (1938–40) relative to weather condition (thermohygrograph readings) in Trinidad on which infection could or could not have occurred, assuming susceptible material to have been present on the trees. The monthly rainfall for the period 1930–39 is also given. It is concluded that infection depends to a great extent on the rainfall, and particularly on the time of rainfall. Certain practical considerations from the data are presented. Spraying is deemed necessary for control, but the kind of sprays and the number of applications required must be determined by the climate of the area concerned.

**Melanose and its control,** H. A. Thullbery (*Fla. State Hort. Soc. Proc.*, *52* (*1939*), *pp. 112–114*).—In the trials reported it was found that a copper spray gave the highest returns based on expenditure, and that pruning sprayed groves increased the monetary returns. Pruning without spraying had definite value, but was not as profitable as one spray application.

**Further light on the nature and cause of psorosis of citrus trees,** A. S. Rhoads. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc.*, *52* (*1939*), *pp. 118–120*).—A review and progress report.

**Diplodia stem-end rot of lemons controlled with sodium ethyl mercuri thiosalicylate,** G. H. Godfrey and W. H. Friend. (Tex. Expt. Sta.). (*Science*, *91* (*1940*), *No. 2352, pp. 94, 95*).—A preliminary report.

**A new Corticium on orange stem,** J. F. Dastur (*Indian Jour. Agr. Sci.*, *10* (*1940*), *No. 1, pp. 89–92, pl. 1*).—*C. album* n. sp. is described.

**Removal of sooty blotch from oranges,** C. P. Naudé (*Union So. Africa Dept. Agr. and Forestry Bul. 212* (*1940*), *pp. 13*).—"When 3.2 oz. of soda ash is added to the chloride of lime-boracic acid solution, a bleaching solution is obtained with high bleaching efficiency which is retained much longer than that of the eusol bleaches. The same bleaching effect was obtained when the boracic acid in this solution was reduced from 4 to 2 oz. per gallon. By replacing the boracic acid and soda ash with sodium bicarbonate, a cheaper bleaching solution is obtained which is as effective in bleaching the sooty blotch affected oranges as the eusol and eusol-soda ash mixtures."

**Papaya diseases,** H. E. Stevens. (U. S. D. A.). (*Fla. State Hort. Soc. Proc.*, *52* (*1939*), *pp. 57–63*).—A general discussion of the cause, appearance, and control of the *Pucciniopsis caricae* leaf blight, *Oidium* mildew, *Rhizoctonia* damping-off, *Colletotrichum* fruit rot, papaya diseases in other parts of the world, nematodes and their control, and injuries by low temperature, moisture, and drought.

**A disease of delphinium,** E. C. Blodgett (*Delphinium [Amer. Delphinium Soc.], 1939, pp. 88–91, figs. 3*).—This note is presented to call attention to a disease of perennial larkspur which has become serious in certain gardens in the vicinity of Moscow, Idaho, characterized by stem splitting or cracking and a weakening of the plant, usually followed by a fatal foot and crown rot and possibly of bacterial origin.

**Report of the delphinium crown rot investigation fellowship,** T. Laskaris (*Delphinium [Amer. Delphinium Soc.], 1939, pp. 102–108, [figs. 5]*).—The organisms responsible for crown and root rots of larkspur are briefly reviewed, and a progress report is presented on results obtained in studies of a new crown rot. The fungus concerned, a *Diplodina*, appears not to have been previously reported or described. It has been very frequently isolated from plants affected with crown rot, whether in early or advanced stages of the trouble. In addition to root and crown rot, the fungus can also cause leaf blight, local stem necrosis, and canker. Circumstantial evidence indicated that the organism should be regarded as a serious cause of crown rot.

**Study practical gardenia canker control as disease increases,** M. A. McKenzie, L. H. Jones, and C. J. Gilgut. (Mass. State Col.). (*Florists' Rev., 85 (1940), No. 2209, pp. 11–13, figs. 3*).—Losses from infection by *Phomopsis gardeniae* are said to have increased with the general replacement of the Veitchii gardenias by the larger flowered but susceptible Belmont and Hadley varities. The canker, twig dieback, and leaf spot phases of the disease are described and their effects evaluated from observation and experiment. It was found that artificial inoculations were successful only on injured tissues, so any control program should stress the need of reducing mechanical injuries to a minimum. In preparing cuttings, it is deemed advisable to cut rather than tear the leaves from the first node to go into the sand, while leaves above should be left intact. When rooted cuttings are potted leaves should not be torn off in firming the soil, and it is advisable to keep new plants at considerable distances from diseased plants. It is suggested that infected blooming plants need not be sacrificed immediately if the flower value warrants delay.

**The effect of the yellows disease on the germinating ability of gladiolus corms,** J. E. Machacek (*Gladiolus [New England Gladiolus Soc.], 1940, pp. 55, 57, 58*).—Experiments reported appear to indicate that affected corms are practically valueless for future use, anly 5 and 9 percent germinating, respectively, in the two tests described. Disinfection with Semesan seemed to have no effect on the germinating ability of the diseased corms.

**Anthracnose and Cladosporium stem spot of peony,** F. Weiss. (U. S. D. A.). (*Phytopathology, 30 (1940), No. 5, pp. 409–417, fig. 1*).—A red-spot disease of peony stems, foliage, and flowers is widely distributed in commercial plantations, but is infrequent in severe form. It sometimes seriously disfigures the plants and may destroy their value for cut flowers. The etiological connection with *C. paeoniae* has hitherto been suspected but not definitely established. At times it has also been confused with a disease first described as anthracnose, but the cause of the latter has never been definitely established. In seeking the cause of this stem spot it was noted that isolates of *Gloeosporium fructigenum* from peony and from *Rubus* could infect peonies as wound parasites. Two other fungi, *Pezizella lythri* and a budding fungus (not identified) also proved pathogenic to peonies and may cause distinctive stem and leaf diseases. *C. paeoniae* is considered the principal cause, its restricted development on young stems probably being due to its low virulence on actively growing tissues. The profuse character of infection, even though the lesions are small, makes this stem spot a significant disease on peonies grown for cut flowers.

**Nematodes and Lemoine disease: The role of nematodes and a chemical stimulus in the Lemoine disease of peonies,** N. A. Brown. (U. S. D. A.). (*Amer. Peony Soc. Bul. 78 (1940), pp. 3–6, fig. 1*).—In the nematode galls it is believed likely that some chemical produced in the plant and associated with the presence of the nematode (*Heterodera marioni*) stimulates to cell activity, which, once started, continues for some time, perhaps until it is eliminated by the plant through rapid growth after root prunings and divisions. Conceivably the cause of the swellings and knobby outgrowths of the so-called Lemoine disease of peonies is the result of a stimulus induced by an earlier nematode infestation.

**The Arkansas rose-disease report,** H. R. Rosen. (Ark. Expt. Sta.). (*Amer. Rose Ann., 1940, pp. 119–122*).—This is a progress report on rose disease control work, with special reference to the influence of weather conditions, and black spot control by fungicides and breeding of resistant varieties.

**Coniothyrium fuckelii Sacc. on rose leaves,** K. Longrée. (Cornell Univ.). (*Phytopathology, 30 (1940), No. 5, pp. 451, 452, fig. 1*).—It is reported that *C. fuckelii*, the cause of stem and graft cankers on roses, may also infect rose leaves attacked by *Diplocarpon rosae*.

**Increasing the efficiency of spraying and dusting practices for disease control,** L. M. Massey. (Cornell Univ.). (*Amer. Rose Ann., 1940, pp. 101–105, pl. 1*).—The author sets forth the main factors in successful rose disease control.

**Powdery mildew of ornamental plants,** F. Weiss (*U. S. Dept. Agr. Leaflet 197 (1940), pp. 4*).—This is an informational leaflet dealing with the powdery mildews of ornamental hosts, the most common of which are one or the other of the two fungus species *Erysiphe cichoracearum* or *E. polygoni*. The principal ornamental hosts of nine common species of surface mildew fungi are listed.

**Control practice for diseases and pests of ornamental plants,** H. Pape (*Die Praxis der Bekämpfung von Krankheiten und Schädlingen der Zierpflanzen. Berlin: Paul Parey, 1939, 3. ed., rev. and enl., pp. VIII+475, pls. 8, figs. 336*).—This is a revised and enlarged edition (E. S. R., 76, p. 817).

**Fungicides and their use on ornamentals and shade trees,** H. C. Young. (Ohio Expt. Sta.). (*Arborist's News, 5 (1940), No. 5, pp. 33–36*).—An informational paper.

**New diseases of Norway maples,** P. P. Pirone. (N. J. Expt. Stas.). (*Trees Mag., 3 (1940), No. 2, pp. 7, 15, 16, 18, figs. 3*).—In addition to the *Verticillium* wilt, and within the past 2 yr., two apparently new diseases of Norway maple have been reported as prevalent in the eastern United States, viz, a canker due to *Phytophthora cambivora*, which appears not to have been previously reported on any host in this country, and bleeding canker due to *P. cactorum*. The symptoms are described, and suggested control measures are given.

**Diseases of trees: Up-to-date information obtained from recent studies of white-pine blister rust,** L. R. Tehon (*Amer. Nurseryman, 71 (1940), No. 6, pp. 20–22*).—This is a summary of progress in blister rust control, and includes notes on the extension of infected areas in the southern Appalachian region and in the North Central States, where the greatest spread occurred. Infection on *Ribes* species was found for the first time in 13 Ohio, 9 Iowa, 2 Wisconsin, 1 Michigan, and 2 Minnesota counties. In areas protected by *Ribes* eradication, control of spread was found so effective that few infections or none occurred on white pine. Damage to young white pine, the time between infection and canker formation, and the finding and testing of the progeny of apparently resistant individual white pines are discussed.

**Needle-bearing internodes on western white pine reproduction in relation to blister rust infection,** T. S. Buchanan. (U. S. D. A.). (*Jour. Forestry, 38 (1940), No. 1, pp. 52–54, fig. 1*).—It is definitely established that the current season's shoots of western white pine (*Pinus monticola*) are relatively resistant to blister rust infection and to a lesser extent that this resistance is a characteristic of the needles on that year's growth. To gain light on the proportion of the target comprised by needles of the current season, 24 young pine trees were studied in detail. Although the data are not considered final, they are presented as an approximate indication of the relative numbers of slightly and highly susceptible needles present on young trees of various ages.

**Fungi causing decay in wind-thrown northwest conifers,** T. S. Buchanan. (U. S. D. A.). (*Jour. Forestry, 38 (1940), No. 3, pp. 276–281*).—Examinations through 1936 were made of trees of *Pseudotsuga taxifolia, Picea sitchensis, Tsuga heterophylla, Abies amabilis,* and *Thuja plicata* blown down on the Olympic Peninsula of Washington in January 1921, sporophores of 21 wood-destroying fungi being observed at some time on the various species and 17 fungi being found to have caused appreciable decay in this wind-thrown timber. In general, sporophores of the different fungi were produced with about equal facility on all tree species examined except western red cedar, but their distribution on the 3 dates of examination did not remain constant and they varied somewhat in persistence. Not all fungi forming sporophores caused identified decay, and not all decay was induced by fungi producing sporophores on these trees. Of the 17 fungi causing decay, 13 were species typically acting as scavengers, 2 were common on living trees, and 2 were common root-rotting species. None acted differently than had been previously described. Fifteen yr. after the blow-down, decays caused by *Fomes pinicola* and *F. applanatus* were present in more than 85 percent of the decayed volume in Sitka spruce and Douglas fir, the only species examined in detail at that time.

**Stains of sapwood and sapwood products and their control,** T. C. Scheffer and R. M. Lindgren (*U. S. Dept. Agr., Tech. Bul. 714 (1940), pp. 124, pls. 9, figs. 16*).—Placed under certain conditions, the sapwood of probably all domestic woods is said to be subject to objectionable fungus discolorations commonly known as sap stain or blue stain. Blue stain is a major problem for lumber and other wood products in the Gulf States and in certain far western regions where pine timber predominates. Occasional brighter-colored fungus discolorations and a number of chemical stains also occur in wood, but they are generally of comparatively minor consequence. The suitability of blue-stained wood for uses where appearance is not a factor is for the most part unimpaired. In cases of heavy staining the toughness of the wood may be reduced significantly, but other strength properties are not practically affected. Large amounts of stain tend to discolor wood pulps objectionably. Blue stain apparently does not adversely affect the painting and gluing qualities or the seasoning of wood, nor does it interfere with preservative treatment of air-dry wood. Wood not containing more than 20 percent water (dry weight basis) will not stain, but previous drying does not preclude the occurrence of blue stain if the wood again becomes wet. The optimum temperatures for important blue-stain fungi are ±70°–85° F., with minimum and maximum of ±32°–40° and 95°, respectively.

Practical control of blue stain lies in rapid seasoning or in surface treatment of freshly cut stock with chemicals. Practices and precautions essential to successful use of the latter are discussed. Chemicals proving most effective for both pine and hardwood lumber were a number of organic mercurials, sodium pentachlorophenolate, and a mixture of sodium tetrachlorophenolate and sodium 2-chloro-*o*-phenylphenolate, while commercial soda and ammonium fluoride were

effective on pine alone, and borax, certain compounds with the borate radical, and sodium tetrachlorophenolate on hardwoods alone. Any of the better chemical treatments investigated may be used with commercial advantage in controlling sap stain and decay in stored hardwood logs, provided treatment is confined to normal banking seasons when insect infestations are less numerous. Chemicals suitable for use on logs include, among others, the same materials proved effective for lumber, but, in general, the concentrations should be substantially higher. A hand-operated spray meets practically all requirements. Present antistain treatments are being extended commercially to green posts, veneer, hoops, shingles, lath, and other materials as a measure of protection during seasoning.

There are 78 references.

**Biochemistry of the wood-rotting fungi.—I, Metabolic products of Lentinus lepideus Fr.**, J. H. Birkinshaw and W. P. K. Findlay (*Biochem. Jour.*, *34* (*1940*), *No. 1*, *pp. 82–88*).—"The wood-rotting fungus *L. lepideus* Fr., when grown on Scotch pine sapwood, gives rise to volatile metabolic products. Among these methyl-*p*-methoxycinnamate, methyl cinnamate, and an ester of anisic acid (probably the methyl ester) have been detected. These products are shown to be absent from uninfected wood. Methyl-*p*-methoxycinnamate has been identified among the products obtained by growth of *L. lepideus* on a malt-agar medium."

**A collected works on nematodes of agricultural crops**, edited by E. S. Kiryanova (*Sbornik rabot po hematodam s.-kh. rastenii. Moskva: Vsesoyuzn. Akad. Selsk. Khoz. Nauk Lenina, Inst. Zashch. Rastenii, 1939, pp. 246+*[2], *Eng. abs., pp. 236–243, figs. 72*).—Papers are included, the translated titles of which are as follows: A Study of Nematode Diseases of Plants in the U. S. S. R., by E. S. Kiryanova Kirjanova); The Root Knot Nematode *Heterodera marioni* (Cornu) in the U. S. S. R., by A. A. Ustinov; The Root Gall Nematode in Kazak, by N. F. Litvinova; Results of Investigating the Root Gall Nematode on *Lavandula vera* in Crimea, by T. A. Ikhtinsjaya and M. N. Arkhangelskaya; Results of the Study and Control of the Sugar Beet Nematode, *Heterodera schachtii* Schmidt, by I. I. Korab and A. P. Butovskii (Butovsky); The Stem Nematode as a Pest of Agricultural Crops in the U. S. S. R., by E. S. Kiryanova (Kirjanova); Results of Observations and Field Experiments Made With the Stem Nematode on Potatoes, by O. D. Belova; Nematodes Injuring Winter Wheat in the Northern Part of the Orel Region, by N. I. Koroleva; A Study of Nematodes on Cereals, by M. I. Frolova; The Wheat Nematode, *Anguillulina tritici*, in the Crimea, by A. A. Meier (Meyer); Nematode Fauna in Tomato Plants (*Lycopersicum esculentum* Mill.) and in the Soil Surrounding Their Roots, by A. T. Tulaganov; The Nematode Disease of the Rubber-Bearing Plant *Scorzonera tau-saghyz* Lipsch. and Bossé and the Problem of Its Control, by N. M. Sveshnikova; and Methods and Technic Used in the Study of Plant Parasitic Nematodes, by T. S. Skarbilovich.

**Eelworm problems in war time**, D. Robertson (*Agr. Prog.* [*Agr. Ed. Assoc., Gt. Brit.*], *17* (*1940*), *No. 1*, *pp. 42–47*).—A discussion of nematode problems in cereals and in root and tuber crops and on the control of these pests.

**An incubating can for laboratory or field use**, F. Weiss and F. F. Smith. (U. S. D. A.). (*Phytopathology*, *30* (*1940*), *No. 5*, *pp. 447–449*, *fig. 1*).—A tin-plated 1-lb. coffee can, with a 2-dr. homeopathic vial fastened to the inside next the bottom and a metal ring and celluloid cover, served the purpose of a "moist chamber" for inoculation experiments. In use, the vial is filled with water and the cut stem or twig to be inoculated is inserted therein. In 5,000 lots the cost was 4½ ct. each.

## ECONOMIC ZOOLOGY—ENTOMOLOGY

**Control of mammals injurious to agriculture in Kansas,** G. E. JOHNSON, rev. by E. H. HERRICK (*Kansas Sta. Cir. 198 (1940), pp. 10, fig. 1*).—This account, which is a revision of Circular 120 (E. S. R., 54, p. 654), deals with the suppression of those rodents which are harmful, such as the pocket gopher, prairie dog, and rat, and also with the destruction of the mole.

**When and why are pheasants abundant?** G. A. SWANSON. (Minn. Expt. Sta.). (*Minn. Conserv., 59 (1938), pp. 20, 21*).—The author finds the reproductive potential of the ring-necked pheasant to be considerably higher than that of most game birds. The various mortality factors which combine to cut down the increase in Minnesota of this species are taken up in detail. Nesting failures are considered to be the most important cause of mortality, and the outstanding cause of nesting failures is interference by man, the destruction of nests by mowers during haying operations being by far the most important loss. In every extensive study of pheasant nesting which has been carried on, over half of the losses of birds have been found to be due to interference by man. An explanation of and plea for the use of a flushing bar to prevent destruction of incubating pheasants during mowing operations is included.

**The cysticercoid of the tapeworm Dendrouterina nycticoracis Olsen 1937 (Dilepidiidae),** O. W. OLSEN. (Minn. Expt. Sta.). (*Helminthol. Soc. Wash. Proc., 6 (1939), No. 1, pp. 20, 21, fig. 1*).

**The occurrence of the fluke Plagiorchis potanini Skrjabin 1928 in Franklin's gull (Larus pipixcan Wagl.) in North America,** O. W. OLSEN. (Minn. Expt. Sta.). (*Helminthol. Soc. Wash. Proc., 6 (1939), No. 1, p. 20*).

**[Notes on economic insects and their control]** (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 416–420, fig. 1*).—The contributions presented (E. S. R., 83, p. 83) are: Definition of the Word "Rotenoid", by R. C. Roark (p. 416) (U. S. D. A.); Combined Derris-Nicotine Dusts for Cabbage Insects, by J. W. Brooks and T. C. Allen (pp. 416, 417) (Univ. Wis.); $\beta$, $\beta^1$ Dichloroethyl Ether for the Control of Gladiolus Thrips, by A. Hartzell and G. F. McKenna (p. 417); The Bee Loss Situation in Utah, by G. F. Knowlton (p. 418) (Utah Expt. Sta.); Serious Reactions to Bee Stings, by F. E. Guyton (pp. 418, 419); "White Marked Spider Beetle" or "Pilferer", by H. Hartnack (p. 419); A Homemade Device for Maintaining Subzero Temperatures, by L. P. Ditman and G. W. Weiland (pp. 419, 420) (Md. Sta.); and Big-Eyed Bug [*Geocoris decoratus* Uhler] Bites Man, by G. F. Knowlton (p. 420) (Utah Sta.).

**Some scientific contributions made at the port of New York,** M. KISLIUK, JR. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 374–379*).—Some of the results of plant inspections for the interception of insects of economic importance made at the port of New York are brought together under the headings of their relation to fruits and vegetables; cotton and related plants; nursery stock, plants, and seeds; packing materials; vetch seed; sugarcane and broomcorn; and miscellaneous insects.

**[Work in economic entomology by the Maine Station]** (*Maine Sta. Bul. 397 (1939), pp. 702–706, 708–713, 715–717, 787, 788, 825–827, 828, 829, fig. 1*).—Included in the work referred to (E. S. R., 81, p. 67) are studies of insects affecting the apple crop, particularly the woolly apple aphid, rosy apple aphid, apple grain aphid, apple aphid, apple fruitfly, and the gypsy moth, by F. H. Lathrop; the corn earworm and the fall armyworm in relation to the European corn borer situation (including descriptions and habits of the pests, losses caused, and means for their control) and investigations of the pea aphid, its control by the use of insecticides and factors influencing the effectiveness of

rotenone dusts, both by J. Hawkins; insects in relation to the transmission of potato virus diseases, by G. W. Simpson; the pea aphid not a factor in the spread of potato virus diseases, by Hawkins; blueberry insects, particularly the blueberry maggot and the blueberry thrips *Frankliniella vaccinii* Morg., and mosquitoes collected in Maine, both by Lathrop.

**[Work in economic entomology by the Wisconsin Station].** (Partly coop. U. S. D. A. et al.). (*Wisconsin Sta. Bul. 449 (1940), pp. 50–67, figs. 6*).—The work of the year reported (E. S. R., 81, p. 541) relates to the possibility of larger yields of honey through the use of good bee stocks, two queens per colony, and soybean flour as a pollen supplement, by C. L. Farrar and C. W. Schaefer; beekeeping as a means of diversifying Wisconsin farming, traps and flypaper helpful in control of clothes moths and carpet beetles, and the control of these pests in house insulation containing animal material, all by H. F. Wilson; control of cabbageworms and cabbage aphids by the use of derris nicotine dust, by J. W. Brooks and T. C. Allen; effect of atomized oil sprays on truck crops, by Allen and T. L. Carpenter; tests with insecticides for the control of cherry casebearers and aphids on apple trees, the black cherry aphid on cherry, and the green apple aphid on apple, by J. H. Lilly; variation in codling moth activity with locality, by C. L. Fluke, J. A. Callenbach, and Lilly; influence of variety on codling moth flights and substitutes for arsenical sprays in codling moth control, both by Callenbach; grasshopper baits no hazard to pheasants, by Lilly; control of the pea aphid by natural enemies and the use of old rotenone dusts, by Wilson and C. E. Dieter; injury to pea plants by horse-drawn dusters in control work, by Wilson, Dieter, and J. H. Paulus; derris dusts effective against pea aphids, by J. E. Dudley, Jr., and T. E. Bronson; development of an improved method of testing peas for resistance to aphids, by C. D. Harrington, E. M. Searls, and R. A. Brink; a study of the effects of aphids on pea plants, by Wilson and Dieter; and the resistance of predators of pea aphids to rotenone, by Fluke and Dieter.

**Proceedings of the Entomological Society of British Columbia** (*Ent. Soc. Brit. Columbia, Proc., No. 36 (1940), pp. [1]+23*).—Contributions presented (E. S. R., 81, p. 672) include the following: The Soft Scale (*Coccus hesperidum*) Infesting Holly on Vancouver Island—A Preliminary Report, by H. Andison (pp. 3–5); A Note on Insects as Disseminators of Fungus Spores, by L. C. Curtis (pp. 6, 7); Notes on the Ecology of *Dermacentor andersoni* in Southern Alberta (pp. 8–11) and New Records of Siphonaptera for British Columbia (pp. 11, 12), both by G. P. Holland; Some Food Plants of Lepidopterous Larvae—List No. 7 (pp. 13, 14) and a Brief Note on an Attempt to Hybridize *Notolophus antiqua badia* Hy. Edw. and *Hemerocampa pseudotsugata* McD. (pp. 14, 15), both by J. R. J. Llewellyn-Jones; and Ectoparasites of Birds and Mammals of British Columbia—IV, The Parasite of Bats (pp. 16–18) and V, Parasites of Domestic Animals (Mammals) (pp. 19–23), both by G. J. Spencer.

**The relative effects on insect metabolism of temperatures derived from constant and variable sources,** T. J. Headlee. (N. J. Expt. Stas.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 361–364*).

**A plot arrangement for timing the applications in a control program,** H. Glasgow. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 357–361, figs. 2*).—The results of an experiment conducted are presented to illustrate the procedure followed and the type of information that may be expected from a timing experiment leading to a control program for the cabbage maggot, the onion maggot, the pea aphid, and others. The method described has been applied effectively in connection with certain fruit problems. "Where an infestation is heavy and is evenly distributed throughout a planting, as in the

example given, the application of this method is relatively simple. Its use becomes more involved, however, when dealing with an infestation that is likely to be somewhat erratic."

**Toxicity studies of mixtures of nicotine and naphthalene as fumigants,** H. H. RICHARDSON. (U. S. D. A.). (*Jour. Econ. Ent.*, *33* (*1940*), *No. 2*, *pp. 368–372*, *figs. 2*).—Fumigation tests of the action of nicotine and naphthalene and their mixtures on the green peach aphid and the greenhouse whitefly, conducted in the laboratory, are reported. All insects were fumigated off their host plants by an air-flow method, which tended to keep the gas concentration constant in the fumigation flasks during the entire exposure period. "When sublethal concentrations (0.006 to 0.19 mg. per liter) of naphthalene were added to a lethal concentration of nicotine (0.0084 mg. per liter), the fumigants appeared compatible, but no increase in toxicity over nicotine alone could be detected against the green peach aphid in half-hour exposures at 25° C. Naphthalene alone in concentrations up to approximate saturation (0.56 mg. per liter) and at the same exposure had little efficiency. Against the greenhouse whitefly the addition of sublethal concentrations of nicotine (0.004 to 0.006 mg. per liter) to lethal concentrations of naphthalene (approximately 0.56 mg. per liter) increased efficiency very definitely over naphthalene alone in exposures of 15 to 75 min. (25°). The speed with which the whiteflies were paralyzed by the mixture was also increased considerably over either naphthalene or nicotine alone. Low and high relative humidity (approximately 0 and 75 percent) appeared to have little effect on the efficiency of the mixture. The naphthalene-nicotine combination seems worth testing under practical conditions."

**Dusting and spraying for the control of insect pests of the Irish potato,** J. R. EYER and J. V. ENZIE (*New Mexico Sta. Bul. 266* (*1939*), *pp. 40*, *figs. 22*).—This is a summary of information on the most injurious pests of the potato in New Mexico, namely, the potato psyllid *Paratrioza cockerelli* Sulc, the western potato leafhopper *Empoasca abrupta* De L. (the nymphs and adults of which produce stippling and hopperburn), flea beetles (*Epitrix* spp. and *Systena taeniata* Say), aphids, and potato beetles. The potato grower is furnished with information on these insects and the nature of the damage which they cause, together with the methods of control which investigations at the station have revealed as most practical and efficient. It is shown that the nymphs of *P. cockerelli*, which produce a disease known as psyllid yellows that results in greatly decreased yields, may be controlled through the use of sprays of lime-sulfur or wettable sulfur, or with sulfur dusts. The adults of *E. abrupta* cannot be successfully eradicated, but a large percentage of the nymphs is killed by the application of sprays or dusts of nicotine. When psyllids are also present 40 percent nicotine sulfate may be added to the sulfur sprays already being used for psyllid control, at the rate of 1 pt. per 100 gal. of sulfur spray. No satisfactory method has been developed for killing the larvae of the several species of flea beetles that injure potato foliage, but the adults may be poisoned by spraying with zinc arsenite at the rate of 2 lb. to 100 gal. of water, or by dusting with calcium arsenate. Earlier studies at the station on psyllid yellows (E. S. R., 69, p. 828; 78, p. 666) have been noted.

**Selenized soil as a control for aphids and red spiders on sorghum in the greenhouse,** R. W. LEUKEL. (U. S. D. A.). (*Phytopathology*, *30* (*1940*), *No. 3*, *pp. 274–276*, *fig. 1*).—In the course of experiments which included the control of aphids and the common red spider, the author grew sorghum in four sections of a greenhouse bench filled with Keyport clay loam to which had been added, 0, 5, 10, and 15 p. p. m., respectively, of selenium in the form of sodium selenate (thoroughly mixed into the whole mass of soil). "Emergence was not affected

by the selenium, but after 2 weeks the average height of the plants was reduced by the three selenium concentrations 19, 43, and 50 percent, respectively, compared with that of the control without selenium. All attempts to infest these plants with aphids or red spiders were futile. The controls, however, became severely infested and were badly damaged. In a second planting in these same sections 3 mo. later, a reduction of 5 to 25 percent was observed in the height of the plants in the selenized soil, and the freedom from insect infestation persisted, although the controls became heavily infested. Similar plantings also were made in soil containing 2, 3, and 4, p. p. m. of selenium. Measurements made 4 weeks after emergence showed no reduction in height of plants in the selenized soil. The controls, grown without selenium, soon became heavily infested with both aphids and red spiders. In the soil containing 2 p. p. m. selenium, red-spider infestation was observed after 8 weeks, but no injury was evident. The plants were green and healthy, while the controls without selenium were stunted and badly discolored. After 14 weeks the plants grown in soil containing 2 p. p. m. selenium showed some evidence of red-spider reproduction and injury. Those grown in soil containing 3 p. p. m. selenium showed some infestation but no apparent injury, while those in soil containing 4 p. p. m. selenium remained free from red spiders and aphids. The Leoti sorgo grown in the selenized soil had formed normal heads and seed after 14 weeks, while in the control soil the plants were stunted and had produced no heads. The length of time that one application of selenium to the soil will provide protection against aphid and red-spider infestation, and the optimum time, manner, and rate of applying additional selenium remain to be determined. It remains to be determined also what effect, if any, the selenium may have on the development of the several diseases of sorghum. It was noted that sorghum root rot developed as abundantly in the selenized as in the nonselenized soil, which indicated that the selenium did not inhibit the development of this disease."

**Experiments with apple pests in 1939**, C. R. Cutright. (Ohio Expt. Sta.). (*Ohio State Hort. Soc. Proc., 73 (1940), pp. 24–32, fig. 1*).—In the 1939 experiments reported excellent control of codling moth was obtained by the use of lead arsenate, oil, and lime. Foliage injury was greatly reduced when zinc sulfate was added to this formula or when flotation sulfur was used with a combination nicotine spray. Several different nicotine schedules gave good control and are available to growers not wishing to wash their fruit. The European red mite has been found to be most effectively held in check in Ohio by the dormant spray oil. Its use nearly always controls the mite during the early part of the growing season. In some years heavy mite populations will develop following the use of oil and may result in many eggs for the grower to control the following season. There is no satisfactory spray for summer use at the present time.

**Certain semi-refined oils for summer spraying on apple trees**, J. M. Ginsburg. (N. J. Expt. Stas.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 332–336*).—Report is made of experiments conducted over a period of several years with petroleum distillates of varying degrees of refinement for the purpose of selecting a cheap oil which could be safely sprayed on apple foliage as a substitute for the highly refined oil that has been used. "Blocks of apple trees, as well as entire apple orchards, containing different varieties were sprayed five to six times during one season with about 0.7 percent oil, mixed with either lead arsenate or nicotine, to control first and second brood codling moth. From the results obtained it appears that a semirefined paraffin distillate of about 70 viscosity and about 88 percent sulfonation, possessing a viscosity index of 90–100, is just as safe for summer spraying on apple trees as is the highly refined oil. The cost of the semirefined distillates is less than half as much as that of the highly refined oil."

**Experimental spraying to control European red mite and rosy apple aphid in 1939 (progress report),** H. N. WORTHLEY and H. M. STEINER (*Pennsylvania Sta. Bul. 390 (1940), pp. [2]+10, figs. 3*).—In this contribution, which attempts to bring the testing record at the station on dormant and delayed dormant sprays (E. S. R., 81, p. 70) up to date, including experiments conducted during 1939, the details are given in four tables. It is concluded that "on dormant trees a tank-mixed emulsion containing 4 percent lubricating oil gave the best kill of European red mite eggs. The addition of 2.5 percent low temperature tar oil gave good control of rosy [apple] aphid without significant reduction in mite control, which did occur where 2.5 percent of high temperature tar oil was employed. Dowspray dormant 2.25 percent plus 1.75 percent lubricating oil also gave satisfactory control of both pests." Results with several less effective spray mixtures and proprietary compounds are given. "Several spray mixtures employed in the delayed dormant period gave a high degree of European red mite control, but the real significance of results against the rosy [apple] aphid was difficult to judge because of the light infestation. From the standpoint of both effectiveness and cost, a tank emulsion of 3 percent lubricating oil plus 0.5 percent low temperature tar oil and 1.3 gal. per 100 of liquid lime-sulfur gave the best results. There was a moderate amount of spray injury to the opening buds, which was rapidly outgrown." Detailed directions are given for the mixing and application of a schedule of economical and effective dormant and delayed dormant sprays involving tank mixture methods.

**Field tests for rosy aphid and budmoth control,** F. Z. HARTZELL and P. J. CHAPMAN. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 336–339*).—The results of field tests of (1) some of the newer dormant sprays on the control of the rosy apple aphid during a severe infestation, (2) to show the effects of the same materials on the eye-spotted budmoth, and (3) to introduce the breaking bud application, with data on control of these two pests, are reported, the details being given in table form.

**New insecticides and spreaders on shade trees,** E. P. FELT and S. W. BROMLEY (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 247–249*).—New developments in the field of insecticides and spreaders for combating shade tree pests, particularly the gypsy moth, Japanese beetle, eastern tent caterpillar, and fall webworm are briefly considered.

**[Contributions on fruit insects]** (*Wash. State Hort. Assoc. Proc., 35 (1939), pp. 7–11, 17–46, 95–105, figs. 8*).—Contributions relating to fruit insects and their control (E. S. R., 81, p. 808), presented at the annual meeting of the Washington State Horticultural Association held at Wenatchee, Wash., in December 1939, are: Results From Experiments With Scraping and Banding as a Supplementary Control Measure for the Codling Moth, by M. A. Yothers (pp. 7–11) (U. S. D. A.); How to Use Nicotine and Oil for Best Results in Codling Moth Control, by E. S. Clarke (pp. 17–19); Further Contributions to a Study of Baits for the Codling Moth, by E. R. Van Leeuwen (pp. 21–29) (U. S. D. A.) (E. S. R., 78, p. 363); Group Action in Codling Moth Control, by I. W. Smith (pp. 31–35); The Pear Psylla Survey, by R. L. Webster (pp. 36–39), Injury to the Tree and Fruit From Different Sprays Applied in 1939, by F. L. Overley, E. L. Overholser, and D. F. Allmendinger (pp. 41–46), and Investigations on Codling Moth and Mite Control, by J. B. Moore, R. L. Webster, K. Groves, and H. Fallscheer (pp. 95–105) (all Wash. Expt. Sta.).

**Identification of the eggs of mid-western grasshoppers,** J. B. TUCK and R. C. SMITH (*Kansas Sta. Tech. Bul. 48 (1939), pp. 39, pls. 11, figs. 2*).—The authors record brief diagnostic descriptions of the external features, especially chorionic sculpturing, of 48 species of grasshoppers that occur in Kansas and

the Great Plains. A photomicrograph of the egg of many of the species and a key for their identification are included.

**Notes on the control of onion thrips,** L. D. Anderson and H. G. Walker. (Va. Truck Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 278–280, fig. 1*).—In tests conducted in greenhouses of the station at Norfolk, Va., atomized tartar emetic-brown sugar solutions with or without burnt onion sauce or pure onion juice kept onion plants free of thrips injury, while plants treated with an emulsified oil-rotenone extract were severely injured. "Plants left untreated for 20 days began to show signs of thrips injury. None of the spray materials injured the foliage. Onion plants treated four times with a tartar emetic-brown sugar solution produced an average yield of 22.4 gm. per plant as compared to an average yield of 6.3 gm. for untreated plants. Tartar emetic-brown sugar solution did not give as good control of thrips on onions in the field as it did in the greenhouse. One application of tartar emetic-brown sugar solution on snap beans heavily infested with onion thrips reduced the number of nymphs by more than 97 percent and prevented reinfestation for at least 7 days."

**Plant pest control,** A. G. Ruggles. (Minn. Expt. Sta.). (*Minn. Hort., 67 (1939), No. 2, p. 29; abs. in Minnesota Sta. Rpt. 1939, p. 52*).—A practical account of the gladiolus thrips, with information on its control through winter and summer treatment.

**Pentatomids attacking tomatoes and experiments on their control,** F. G. Mundinger. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 275–278, fig. 1*).—In work aimed at prevention of injury by certain pentatomids, the feeding of which in western New York resulted in yellowish discolorations of tomatoes referred to as cloudy spots, Dry Pyrocide (containing 0.3 percent pyrethrins) was found so much more toxic to *Euschistus variolarius*, the most prevalent species, than any of the other materials applied, which included pyrethrum, rotenone, and nicotine preparations, as to suggest it as a most promising material for control of these insects.

**Experiments for the control of the plant bug Horcius nobilellus (Berg) on cotton** [trans. title], E. J. Hambleton (*Arq. Inst. Biol. [São Paulo], 10 (1939), pp. 207–218, figs. 2; Eng. abs., pp. 217, 218*).—The results of field experiments conducted in 1939 with several insecticides to control the nymphs and adults of *H. nobilellus* are reported upon.

**The repellency of pyrethrin dusts to the beet leafhopper on tomatoes,** B. F. Coon and C. Wakeland. (Idaho Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 389–393*).—Experiments conducted with Dry Pyrocide and Pyrocide 20, commercial preparations of pyrethrum, incorporated into diatomaceous earth as a means of controlling the beet leafhopper on tomatoes, are reported. In the field experiments their application to tomato plants had some effect in preventing the feeding of the beet leafhopper, the treated and untreated plats in the field being distinguished readily. An activated dust of Dry Pyrocide in diatomaceous earth appears to be more effective than a similar dust of Pyrocide 20 having the same pyrethrin content. The application of dusts to tomato plants did not apparently hinder growth or prevent pollination or the setting of fruit. In greenhouse experiments diatomaceous earth was found to be partially effective in preventing the feeding of the pest. Pyrocide 20 and Dry Pyrocide incorporated in diatomaceous earth were effective in entirely preventing the feeding of this pest on tomatoes for 72 to 96 hr., respectively. "A pyrethrin content of 0.23 percent was determined as the minimum concentration at which these two substances can be relied upon to give complete controls in the greenhouse. The period of effectiveness of Dry Pyrocide and Pyrocide 20 in diatomaceous earth, at the same percentage of pyrethrins, is approximately the same, differing not more than a few hours."

**A revision of the North American aphids of the genus Myzus,** P. W. MASON (*U. S. Dept. Agr., Misc. Pub. 371 (1940), pp. 31, figs. 7*).—This report of a systematic study of the North American species of the aphid genus *Myzus* Passerini, a group of major economic importance, brings together the known species, 20 in number, of which 3 are described as new, lists their hosts and gives their distributions, the locations of their types, and descriptions, drawings, and keys for their separation. A list is given of 35 references to the literature cited.

**The Hawaiian beet webworm and its control,** H. G. WALKER and L. D. ANDERSON (*Virginia Truck Sta. Bul. 103 (1939), pp. 1649–1659, figs. 4*).—The results of control experiments conducted in the Norfolk area with the Hawaiian beet webworm, an earlier report of which as a pest of spinach in the State has been noted (E. S. R., 57, p. 857), are reported. The work has led to the recommendation that summer weed hosts, such as pigweed, purslane, and lambsquarters, be held in check and destroyed, and that the planting of fall spinach be delayed as long as possible, since spinach planted before September 5 is frequently heavily infested, while spinach planted after September 15 is seldom seriously injured by the pest. Infested spinach should be dusted with a pyrethrum dust such as Pyrocide or a pyrethrum powder diluted to contain 0.2 percent pyrethrins. The dust should be applied while the plants are dry and at the rate of from 35 to 45 lb. of dust per acre. For best results the duster should be equipped with a canopy or short trailer to confine the dust around the plants and prevent it from blowing away until it has had time to whirl around under the plants and give an effective coverage.

**Control of the Hawaiian beet webworm,** H. G. WALKER and L. D. ANDERSON. (Va. Truck Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 272–275*).—This contribution reports upon control work with the Hawaiian beet webworm, a serious pest of early fall planted spinach in tidewater Virginia, which in mid-September of 1939 was a source of injury to beets and spinach. The data presented are based upon the work noted above.

**Notes on Elasmopalpus lignosellus Zeller (Lep.: Pyr.), a serious pest of cereal crops in the State of S. Paula** [trans. title], H. F. G. SAUER (*Arq. Inst. Biol. [São Paulo], 10 (1939), pp. 199–206, pls. 2; Eng. abs., p. 206*).—A brief report is made of a serious outbreak of the lesser cornstalk borer which caused severe losses in dry-land rice plantations in the northeastern part of the State of São Paulo, Brazil. The attack of this widely distributed pyralid moth is limited principally to members of the grass and legume families in Brazil. Notes on the habits and importance of this species are presented, together with considerations regarding the time of planting and its relation to the amount of injury caused.

**Control of the leaf roller Platynota flavedana Clem. on roses,** C. C. HAMILTON. (N. J. Expt. Stas.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 364–368*).—Report is made of a study of the tortricid moth *P. flavedana*, which during the fall and winter of 1938–39 was found doing considerable damage to the foliage and buds of greenhouse roses at Cranbury, N. J. Earlier records have reported this lepidopteran merely as a general feeder. In observations made during the spring and summer months, the life cycle appeared to require about 5 to 6 weeks. "Sprays containing the active principles of pyrethrum flowers, which have proven effective against other leaf rollers attacking greenhouse roses, were not practical against *P. flavedana*. The control was poor, and the cost was high. Fumigating twice a week at regular intervals with Nico-Fume pressure fumigators killed the adults before they laid many eggs. By directing the nicotine fumes across the beds and beneath the foliage of the rose plants,

a greatly reduced dosage of nicotine could be used. Nine 1 lb. Nico-Fume pressure fumigators, used in the above manner twice a week, gave better control than a pyrethrum and soap spray and at a greatly reduced cost. Fumigation with the Nico-Fume pressure fumigators, where the nicotine fumes could be directed on the plants in an initial heavy concentration, permitted use of smaller amounts of material."

**The grape plume moth,** W. D. WHITCOMB and W. E. TOMLINSON, JR. (Mass. Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 372–374, fig. 1*).—Report is made of observations of the grape plume moth conducted in the metropolitan area of Boston, where a majority of the home gardens contain one or more vines growing on arbors or trellises. In 1939 from 32 to 78 percent of the buds examined near Waltham were found infested. The eggs, which have not previously been described, are laid singly in late May and early June, being imbedded in the pubescence at the axil of a branch or bud on the older grape canes. In two control experiments conducted, it was found that a dormant application of either 1 percent sodium dinitrocresylate or oil emulsion diluted to contain 3 percent actual oil gave satisfactory control without injury to the vines.

**Insecticide tests against the pecan nut casebearer in Texas in 1938,** C. B. NICKELS and W. C. PIERCE. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 379–382*).—The results of spray experiments for the control of the pecan nut casebearer, conducted at Crystal City, Tex., in 1938, are reported, the details being given in three tables. The materials employed included lead arsenate, alone and in combination with a summer oil emulsion, and with soybean flour and a sulfated alcohol, and cryolite with and without a summer oil. All of the insecticidal treatments increased the nut yield. The largest yield was obtained from trees sprayed with lead arsenate at the rate of 6 lb. per 100 gal. and with this material in combination with summer oil. "At the end of the season hibernacula were about three times as abundant on check trees as on trees that had been sprayed with lead arsenate, 6 lb., and summer oil, 1 gal., to each 100 gal. of spray."

**Experiences in New York with non-residue sprays for the codling moth,** S. W. HARMAN. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No 2, pp. 340–342*).—By the use of nicotine mixtures the author has avoided excessive deposits of lead and arsenic on the fruit of trees sprayed for control of the codling moth at a cost deemed not excessive considering the advantages obtained. "Experimental evidence has shown that nicotine sprays properly applied may be even more effective than lead arsenate for combating the codling moth. It has been possible in isolated plantings to practically exterminate the first brood worms, thereby avoiding the use of further summer sprays for the codling moth." It is pointed out that the work reported applies only to conditions met with in the northeastern portions of the country.

**Laboratory studies of codling moth larval attractants,** E. H. SIEGLER. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 342–345*).—Of the several sugars and other materials used as possible larval attractants for the codling moth, in the experiments reported brown sugar, because of its availability and low cost, was found to offer the greatest promise. "The addition of brown sugar to lead arsenate, calcium arsenate, nicotine bentonite, and phenothiazine considerably increased the toxicity of these insecticides under laboratory conditions. In combination with paris green it decreased the percentage of injury. With pyrethrum, however, brown sugar was not notably effective as an attractant and with derris it had no value. It is thought that derris and pyrethrum may kill the codling moth larva largely by contact action." Details of the results obtained are reported in table form.

**Mass liberation of parasites of the oriental fruit moth for immediate reduction of infestation,** M. H. Brunson. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 346–349*).—A report is made of a detailed study conducted in 1938 in three peach orchards that had received liberations of *Macrocentrus ancylivorus* Roh. and *Bassus diversus* Mues. and in two orchards that had received no parasites, with a view to determining whether mass liberations of these natural enemies of the oriental fruit moth would reduce fruit infestation. The peach orchards were located in Mercer and Middlesex Counties in New Jersey and in Bucks County in Pennsylvania. "Parasitism of the first- and second-brood fruit moth larvae was greater and the ripe-fruit infestation was less in the orchards receiving parasites than in the orchards receiving no parasites. The results obtained appear to show a definite relation between the percentage of larval parasitism and the number of ripe fruits infested per tree and per acre. Also, it was shown that in different parts of the same general area different species of parasites predominate."

**Effect of larval parasitization of the oriental fruit moth on infestation,** W. P. Yetter, Jr., and H. W. Allen. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 349–353*).—Report is made of an experiment conducted in eight peach orchards in Burlington County, N. J., in 1938. "On representative trees detailed records were made of the first- and second-brood fruit moth population in infested twigs and immature drops and of the degree of parasitism. At harvest time counts were made of the ripe-fruit infestation in Elberta or varieties ripening at about the same time. In this series of orchards there was found to be a definite relationship between the larval parasitization and the infestation in ripe fruit. The records obtained ranged from an infestation of 4 percent, or on an average 16.1 infested fruits per tree, in orchards having average seasonal parasitization of more than 70 percent to infestation of 30.4 percent, or 108.9 infested fruits per tree, in orchards having average seasonal parasitization of less than 60 percent. The reduction of infestation in orchards having high parasitization was sufficient to be of important commercial value."

**Oriental fruit moth larval parasitism as related to infestation,** B. F. Driggers. (N. J. Expt. Stas.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 353–357*).—The results of a 3-yr. survey of the parasitism of twig-feeding larvae and fruit infestation by the oriental fruit moth, conducted in a number of New Jersey orchards from 1937 to 1939, inclusive, are reported. The details are given in table form. "A high degree of parasitism of the first two broods of larvae was found in the majority of orchards in each of the 3 yr. In southern New Jersey the principal parasite found was *Macrocentrus ancylivorus* and in northern New Jersey *Glypta rufiscutellaris*. Fruit infestation in each of the 3 yr. was light to moderate on varieties ripening during the Elberta season in the majority of the orchards. No strict correlation was found between either percentage total parasitism or second brood parasitism and percentage fruit infestation. A correlation was found between the nature of the planting and the percentage fruit infestation. Orchards in which late ripening varieties were interplanted with early and midseason ripening varieties of peaches showed high fruit infestation counts on the late ripening varieties. Blocks planted solid to late ripening varieties showed the lowest fruit infestation counts. The results reported, if substantiated by additional observations, can be applied to advantage by peach growers in arranging future plantings of peaches. The interplanting of early-, mid-, and late-season varieties of peaches should be avoided as well as the interplanting of peaches and apples."

**The metabolism in the corn earworm.—III, Weight, water, and diapause,** L. P. Ditman, G. S. Weiland, and J. H. Guill, Jr. (Md. Expt. Sta.).

(*Jour. Econ. Ent., 33 (1940), No. 2, pp. 282–295, figs. 7*).—This contribution is in continuation of that noted (E. S. R., 81, p. 680). It was found that "larvae attain greater size when reared at 24.4° than at 30°. Pupae are larger when the prepupal period is spent in relatively wet soil than in dry soil. Death of prepupae results from dehydration in dry soil (1 to 2 percent moisture) at 18.9° or below; mortality is high among prepupae in wet soil (18 to 25 percent moisture) at 13.3°. Loss of weight during the pupal period varies inversely as the humidities at which the pupae have been stored; soil moisture has a similar effect. At constant low humidity there is a greater weight loss during the entire pupal stage at cool incubator temperatures than at warm, a result of longer exposure. Pupae in diapause lose weight less rapidly at low humidity than pupae not in diapause. Differences in loss of weight at various humidities appear to be due entirely to variations in loss of water rather than of dry weight. Diapause during the pupal period is caused by low temperatures during the larval period. Larvae reared at 18.9° produce pupae, some groups of which diapause to the extent of 50 percent. This explains the occasional occurrence of pupae undergoing diapause during the summer after cool weather and the preponderance of pupae with tendency to enter diapause which are always to be found in early fall. Undercooling and freezing points and bound water determinations indicate that even corn earworm pupae not in diapause can stand subzero temperatures for at least short periods. Preliminary attempts to cold harden pupae indicate that alternating low and high temperatures are necessary and that only individuals in diapause harden. Pupae not undergoing diapause resume their normal development during periods of warmth."

**Notes on Lepidoptera affecting cotton in Brazil** [trans. title], E. J. HAMBLETON (*Arq. Inst. Biol. [São Paulo], 10 (1939), pp. 235–248; Eng. abs., p. 247*).—Notes are given on 36 insect forms attacking the cotton plant in Brazil, the majority of which have been reared to maturity from immature larvae collected in the field. Notes on the hymenopterous and dipterous parasites reared from many of the species reported are included.

**Control of aquatic midges, with notes on the biology of certain species,** H. L. FELLTON (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 252–264, figs. 3*).—Laboratory and field investigations and actual field operations for the control of certain species of the bloodsucking midges of the family Chironomidae, conducted at the site of the New York World's Fair and commenced in July 1938, are reported. The details are given in six tables and include an analysis of lake water, proportions of the various species found in three typical samples of larval habitat in Fountain Lake, species present in various types of bottom at different depths in Fountain Lake, effect of drying upon hatching of eggs, effect of sodium chloride on larvae of midges, and control of aquatic midges by various treatments based on laboratory tests in battery jars.

**Toxicities to the housefly of smoke from derris and pyrethrum,** L. D. GOODHUE and W. N. SULLIVAN. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 329–332, fig. 1*).—The effect of smoke from a burning mixture consisting of 50 percent derris, 30 percent cornstalks, and 20 percent sodium nitrate against the housefly is reported. The tests were made by exposing "the flies in cages in a Peet-Grady chamber for 1 hr. at 25° to 29° C. Derris smoke was more than 10 times as toxic as the smoke from pyrethrum burned in the same way. The presence of rotenone in the smoke, even after 1 hr., was demonstrated by the Goodhue Red color test. In some preliminary tests aphids were also killed, but cockroaches were unaffected. Although pyrethrum cannot be dispersed effectively by this method, the results of these tests show that derris may be applied in this manner. It appears, therefore, that other easily decomposed or nonvolatile materials might also be used as fumigants."

**Habits of the larvae of Gasterophilus nasalis (L.) in the mouth of the horse,** H. O. SCHROEDER. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 382–384*).—Experiments were conducted with five horses infested with newly hatched larvae of the throat botfly. In subsequent post-mortem examinations both first- and second-instar larvae were recovered from the mouth. They were found invading the spaces between the teeth below the gum line and behind the alveolar process of the gums. None was found burrowing in any of the other mouth tissue. Necrosis of the tissue was found to result from the presence of the larvae. The larvae molt to the second instar and experience a short period of growth before passing to the duodenum. The minimum and maximum durations of the first stadium approximate 18 and 24 days, respectively.

**Paradexodes epilachnae, a tachinid parasite of the Mexican bean beetle,** B. J. LANDIS and N. F. HOWARD (*U. S. Dept. Agr., Tech. Bul. 721 (1940), pp. 32, figs. 23*).—A tachinid parasite of the Mexican bean beetle, first collected near Mexico City in 1921 and later found to parasitize the larval stages of the bean beetle in that area, described by Aldrich in 1923 as *P. epilachnae*, has been investigated and attempts made at its introduction into the United States. Studies conducted in Mexico from 1922 to 1930 revealed it to be of considerable importance in the control of this pest. From a stock obtained in 1929 and 1930, 145,500 adults were reared at Columbus, Ohio, and 82,000 adults were released in 19 States during the period 1931 to 1935, inclusive. The parasite reproduced rapidly in the field during the same season that releases were made but appeared to be unable to withstand the winter. The known hosts consist of the Mexican bean beetle, *Epilachna mexicana* Muls., *E. obscurella* Muls., *E. virgata* Muls., and the squash beetle. The mature eggs are deposited on the host larvae, and the maggots enter within a few minutes. A complete generation occurs in about 30 days, the larvae requiring about 10 days and the pupal stage slightly longer. The parasite was found in *Epilachna* larvae in Mexico from June 7 to December 3, and it seems imperative that host larvae be present throughout the year. *Brachymeria carinatifrons* Gahan was an abundant hyperparasite in Mexico.

**Parasitic castration of Anasa tristis DeG. by Trichopoda pennipes Fab., and its effect on reproduction,** R. L. BEARD. (Conn. [New Haven] Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 269–272, figs. 2*).—In a study of the effect of parasitism of the squash bug by the tachinid fly *T. pennipes*, the biology of which has been outlined by Worthley (E. S. R., 52, p. 156), it has been found that the parasitic castration caused by the larvae is manifested by a progressive atrophy of the reproductive organs. This is due neither to a systemic effect nor to a strictly mechanical injury. The degeneration of the testes causes no reduction in reproductive activity. The loss of functional ovaries is reflected in a limited suppression of oviposition, the extent of which has been estimated for a natural population during the past 3 yr.

**On the life history and bionomics of Chrysomyia rufifacies Macq. (order Diptera, family Calliphoridae),** D. N. ROY and L. B. SIDDONS (*Parasitology, 31 (1939), No. 4, pp. 442–447*).—Observations of the bionomics of *C. rufifacies* in India, where it is widely distributed and mainly necrophagous in its habits, are reported. It has recently become a serious pest of sheep in Australia.

**Inexpensive Japanese beetle traps,** G. S. LANGFORD, E. N. CORY, and F. B. WHITTINGTON. (Univ. Md.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 309–316, figs. 10*).—Report is made of the development of Japanese beetle traps and trap investigations, the details being given in tables and figures. The work led to the development of a cheap trap with no loss of efficiency.

**The value of traps in Japanese beetle control,** G. S. LANGFORD, S. L. CROSTHWAIT, and F. B. WHITTINGTON. (Univ. Md.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 317–320*).—In a large scale trapping demonstration in Maryland 5,338 traps on 6,749 acres of land caught approximately 30 percent of the beetles produced in the area. The results obtained on individual farms indicate that "a much higher efficiency may be expected if 1 trap to the acre is used and the trap is operated efficiently. Many individual farmers caught from 40 percent to over 100 percent of the quantity of beetles produced on their property. It was impossible to check accurately the value of traps in protecting crops, but both field observations and opinions of farmers using traps indicate that traps can be profitably used to lessen crop losses. The results obtained also show that traps are not efficient to the extent of fully protecting crops from Japanese beetle damage, but there is every indication that they have a place in a control program, not only as a supplementary control measure, but under certain conditions, as a direct measure."

**Relation of color to the effectiveness of Japanese beetle traps,** W. E. FLEMING, E. D. BURGESS, and W. W. MAINES. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 320–327*).—In investigations conducted during the summer of 1939, traps painted entirely yellow were found to be definitely superior in effectiveness to those painted aluminum, white, light yellow, light blue, dark blue, pink, red, orange, reddish orange, and green varying in shade from light to dark and from yellowish to bluish. The evidence obtained during 1939 showed that a scouting trap painted with a yellow to which no other pigment was added captured 50.8 percent more beetles than the green and white standard trap which has been used extensively in recent years. The addition of yellow to other pigments always enhanced their effectiveness. Thus, in order to secure the greatest capture of the beetles attracted, the trap should be painted with a primary yellow. "It was demonstrated conclusively that a trap painted green and white is more effective than a green trap in capturing the Japanese beetles attracted to it. It was found, however, that when the baffle and the inside of the funnel of a green trap were painted white, the trap functioned as a white trap; when these parts of a white trap were painted green, the trap performed as a green trap. The shade of green on the outside of the funnel and on the beetle receptacle was a minor factor. As the color of the baffle and the inside of the funnel govern the effectiveness of the trap, there seems to be no necessity for using a dual color scheme on the trap."

**Properties of two samples of commercial geraniol used in Japanese beetle baits,** H. A. JONES and H. L. HALLER. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 327–329*).—The physical and chemical properties of two samples of commercial geraniol and a sample of pure geraniol, the fractionation of geraniol A and properties of fractions, and the fractionation of geraniol B and properties of fractions are reported in detail in tables. The preliminary results are considered to have indicated wide enough differences among commercial geraniols to warrant a more detailed investigation of the subject, leading to the development of specifications that will give a product of still greater attractiveness to the beetles.

**Survival of type A milky disease of Japanese beetle larvae under adverse field conditions,** R. T. WHITE. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 303–306*).—The results of certain field experiments of the so-called type A milky disease of the Japanese beetle grub, which have demonstrated the adaptability of the causative organism to a large variety of adverse conditions, are reported, the details being given in tables. The introduction of larvae infected with this type of milky disease organism into field plats in the fall

of 1935 resulted in the establishment of the organism, despite subsequent extremely abnormal climatic conditions which reduced the larval population to a minimum during the winter months. Similarly neither the excessively wet condition of the soil nor the extreme dryness prevailing later at certain times lessened its effectiveness. By 1938 conditions permitted a great increase in the abundance of the pest in the general vicinity, but in the disease plats the number of grubs fell off to a marked extent and the population of these plats continued at a low level through 1939. In 1938 the disease was found as far as 200 ft. from the plats and the following year was found in check areas as much as 500 yd. away. The findings indicate that when once the soil becomes highly infectious with the causal agent, no substantial population of Japanese beetle larvae can exist. Serious turf injury can thus be reduced, if not entirely prevented, by the introduction of the causal agent of type A milky disease. A rapid build-up and spread of the organism may be expected when a reasonably heavy larval population occurs. The ability of this agent to withstand adverse conditions and its permanence when once established emphasize its value as a factor in the economic control of the Japanese beetle. It should be possible to introduce the causal agent before the Japanese beetle arrives, or soon after it has reached a given point, and before numbers sufficient to cause injury have become established.

**Effect of the introduction of milky diseases on populations of Japanese beetle larvae,** R. T. White and S. R. Dutky. (U. S. D. A. and N. J. Expt. Stas.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 306–309*).—Investigations conducted at the Moorestown, N. J., laboratory during the period 1935–39, in connection with those above noted, have shown that milky diseases of the Japanese beetle are playing an important role in reducing populations of these larvae. "Surveys and examinations of soil samples from areas in which the larvae had not yet become abundant failed to show the presence of the agents causing these diseases. Living grubs were used as a culture medium, since to date no artificial medium has been found which permits the organisms to develop to the spore stage. Such grubs, inoculated with the causal agent and held 10 to 12 days at a temperature of 86° F., contained approximately 1 to 3 billion spores. These diseased grubs were then ground and either diluted with water for immediate application or incorporated with powdered talc for storage. Numerous methods of treatment, including various dosages of the inoculum and intervals of application, were used in field studies. Dosages of about 25 million to 1,500 million spores per square foot, applied continuously and in spots, resulted in successful establishment and subsequent build-up of the disease. Field and laboratory observations showed that birds and insects are important natural agents of dispersion of this disease."

**The rose leaf beetle in Pennsylvania,** M. Wood (*Pennsylvania Sta. Bul. 387 (1940), pp. [2]+ 22, figs. 8*).—This bulletin reports upon the classification and synonymy, distribution, morphology, life history and habits of the adult and immature stages, food habits of the adults, natural enemies, and artificial control of the rose leaf beetle. This native beetle of the North American Continent, first described in 1824 and subsequently reported as damaging various fruits, shrubs, and trees, has been the source of considerable injury to apple fruits and plum foliage in certain commercial orchards in Adams County. It is of common occurrence in southern Pennsylvania and is distributed throughout most of the United States and southern Canada east of the Rocky Mountains. The adults appear to be general feeders, showing preference for roses, certain dogwoods, cinquefoil, blackberry, clover, and culti-

vated fruits. Its feeding upon the apple fruit commences about June 1 and continues through the month, and at the same time attacks may be made upon cherry, peach, pear, and plum. Its natural enemies include a nematode and a robber fly larva in the soil and a fungus that attacks larvae and pupae if the ground is excessively moist. Rose leaf beetle damage to apple fruits has been most severe in unsprayed or poorly sprayed orchards. Tests indicate that control may be obtained by thorough spraying, using 3 lb. of lead arsenate per 100 gal. of spray mixture. Apples should be well covered with spray just before beetle attack, which occurs during the last week of May or first week of June in the latitude of Adams County. Sprays usually recommended at this time for the control of other apple insects should serve to prevent damage to fruit from rose leaf beetle attack.

A three-page list of references to the literature is included.

**Rotenone-bearing insecticides for the control of the elm leaf beetle (Galerucella xanthomelaena Shrank)**, F. L. Gambrell. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 264–269*).—A preliminary report is made based upon tests during the seasons of 1938 and 1939 of rotenone-bearing insecticides in comparison with arsenate of lead for the control of the elm leaf beetle. Details of the work with this beetle, which has been a serious problem in many towns and communities of western New York for several years, are given in four tables. Experiments in 1938 indicated that "sprays containing either 4 lb. of cube powder or 6 lb. of arsenate of lead to 100 gal. of water were quite effective when applied after more than half of the eggs had hatched. In 1939, spray mixtures containing either derris (2 or 4 lb.) or arsenate of lead (4 to 6 lb.) in 100 gal. of water gave satisfactory control if applied on or after the second week of June. Limited tests with 2.5 percent rotenone extract, diluted 1 to 400, effected a high degree of control of both larvae and adults. Investigations to date do not necessarily indicate that rotenone sprays will entirely replace arsenate of lead in the spray program for the control of the elm leaf beetle, but it seems probable that under certain conditions these materials will be preferable. They should occupy an important field if present indications are borne out by further experiments, coupled with satisfactory reports from commercial tree-spraying companies, villages, or other organizations. In field tests no appreciable differences were noted between the effectiveness of regular derris and that of stabilized derris (containing an antioxidant), with the possible exception of the influence on the unhatched eggs."

**Wireworm injury to tobacco plants**, H. H. Jewett (*Kentucky Sta. Bul. 398 (1940), pp. 16, figs. 5*).—Report is made of studies of the wireworms that have been found in tobacco fields in the bluegrass region of Kentucky, which include *Aeolus mellillus* (Say), *Conoderes auritus* (Hbst.), *C. bellus* (Say), and *C. lividus* (DeG.). Of these *A. mellillus* makes up about 90 percent and is the most destructive, with *C. auritus* next in importance. For several seasons *C. bellus* and *C. lividus* have been of no importance as pests of young tobacco plants. No species of *Melanotus* has been found injuring tobacco, although an occasional specimen has been taken by screening soil samples, and specimens in the station collection are labeled as having been found injuring corn and tobacco. The percentages of plants injured by wireworms during the seasons of 1935 to 1939 varied from 22.9 to 61.1 and the percentages of plants killed from 1.1 to 3.1. "Tobacco plants can recover from severe injury, but recovery is slower and subsequent growth much more irregular on poor than on fertile soil. The population of wireworms in new bluegrass sod increased rapidly, and in 3 yr. was more than one-half as large as that in old sod and in 4 yr. was equal to

that in old sod. Wireworm injury to tobacco plants was not reduced by fall plowing, but thorough cultivation before setting the plants reduced injury slightly. Thorough cultivation had the added benefit of getting the soil in excellent condition for setting plants. The size and type of plants has much to do with resistance to wireworm injury. Small, slender plants recovered slowly from injury and made irregular growth. Tender plants were not as satisfactory as hardened plants. Short plants were more likely to be injured in the buds. Plants with stalks the thickness of a lead pencil, or larger, recovered from injury more quickly than smaller plants. A greater percentage of plants were injured when set early than when set late. Very little difference occurred till about June 15, or a few days later, when there was a reduction of about one-half in the percentage of injured plants."

**Dichloroethyl ether for wireworm control,** B. B. Pepper. (N. J. Expt. Stas.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 280–282*).—Report is made of tests of dichloroethyl ether, conducted from 1936 to 1939, inclusive, under field conditions on vegetable crops infested with wireworms. The results, details of which are summarized in table form, have shown that all living larvae of wireworms on cruciferous crops in any of the treatments of 1 cc. or more dichloroethyl ether per plant were 5 in. or more laterally from the base of the plants. "In some cases, especially under very dry conditions, living larvae were found at depths of 6 or more inches, but under most conditions good vertical penetration of the chemical was obtained. This was determined by odor. Odor of dichloroethyl ether could be detected in the soil for a period of 2 weeks or more. The half cubic centimeter dosage failed to give adequate control, while dosages of 1 cc. or more gave almost complete control on cabbage and related plants. The amount of water carrying the chemical apparently had little effect on the mortality of the insects, although when no water was used the mortality was only 40 percent. In experiments on beets, swiss chard, and horseradish, where only 1 pt. of water carrying 5 cc. of dichloroethyl ether was applied per linear foot of row, poor wetting of the soil immediately surrounding the roots resulted and consequently a low kill of wireworms was obtained. The information at hand and observations made during the course of these experiments indicate that dichloroethyl ether, to be reasonably effective against wireworms and some other insects, must be in solution or in an emulsion. The material appears to be a very poor fumigant but an extremely toxic contact insecticide. During the course of the wireworm studies it was noted that larvae and puparia of the cabbage maggot, larvae of the Japanese beetle, earthworms, and garden centipedes, were destroyed by the dichloroethyl ether treatments which were effective against wireworms. During 1939 large plats of cabbage and cauliflower were treated commercially with dichloroethyl ether at the concentration of 1 fluid oz. per gallon of water, applying one-third of a pint of the liquid per plant. The wireworms were killed in these plats and a normal crop was harvested, while approximately 50 percent of the plants in the untreated sections of the field were destroyed by wireworms."

**Mealworms,** R. T. Cotton (*U. S. Dept. Agr. Leaflet 195 (1940), pp. [1]+5, fig. 1*).—A practical account of the habits, life history, information as to rearing and use for fish bait or food for birds and small mammals, and control measures, the details of the latter having been given in Farmers' Bulletin 1483 (E. S. R., 55, p. 253).

**Scolytus sulcatus Lec. transmits Dutch elm disease fungus under controlled conditions,** W. D. Buchanan. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 250, 251*).—Experiments have shown that *S. sulcatus*, which breeds in apple, elm, plum, peach, and mountain ash in parts of New York,

Connecticut, and New Jersey, is capable of transmitting the Dutch elm disease fungus (*Ceratostomella ulmi* (Schwarz) Buisman) under controlled conditions, but there is as yet no proof that this bark beetle is responsible for elms becoming infected with this fungus in nature. Reference is made to a preliminary study of the biology of this beetle by Pechuman (E. S. R., 80, p. 82).

**Observations on two ambrosia beetles and their associated fungi,** J. G. Leach, A. C. Hodson, St. J. P. Chilton, and C. M. Christensen. (Minn. Expt. Sta.). (*Phytopathology, 30 (1940), No. 3, pp. 227–236, figs. 4*).—An account is given of studies of two ambrosia beetles (*Trypodendron retusum* Sw. and *T. betulae* Lec.) affecting aspen and birch, respectively. Two fungi that were grown in pure culture are considered to be very closely related strains of one species. This species probably is not identical with any previously named fungus, but because of lack of any extensive studies of the ambrosia fungi associated with other ambrosia beetles, it was not described as a new species.

**Vitamin content of bee foods.—II, Vitamin $B_1$ content of royal jelly and bee bread,** M. H. Haydak and L. S. Palmer. (Minn. Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 396, 397*).—In this further contribution (E. S. R., 80, p. 376), royal jelly was shown to exhibit vitamin $B_1$ activity toward polyneuritic rats equal to about 3$\gamma$ of thiamin chloride per gram of fresh and 9$\gamma$ per gram of dry matter. Bee bread shows vitamin $B_1$ activity toward polyneuritic rats corresponding to that of 4.5$\gamma$ and 6.4$\gamma$ of thiamin chloride per gram of fresh and dry matter, respectively.

**Comparative value of pollen and pollen substitutes.—II, Bee bread and soy bean flour,** M. H. Haydak. (Minn. Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 397–399*).—In this further study (E. S. R., 82, p. 366), colonies consisting of young bees that had never eaten pollen were kept under controlled conditions and fed bee bread, various brands of soybean flour, and soybean flour-dry skim milk mixture, respectively. "The development of bodies of the bees in the experimental colonies proceeded normally except in the colony which was fed the soybean flour of high fat content and low temperature treatment, where the development was retarded. Mortality in the colonies fed pollen substitutes was, on an average, higher than that in the control colonies. The number of bees reared by the experimental colonies varied considerably, being lower in the colonies fed soybean flour and higher than that in the control in the colony which was supplied with soybean flour-dry skim milk mixture. The weights of emerging bees produced by the experimental colonies, on an average, compared favorably with those of the control."

**The thermal resistance of Bacillus larvae,** C. E. Burnside. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 399–405*).—In investigations reported, the details of which are given in seven tables, spores of the American foulbrood organism were heated, their viability being tested by culturing and their virulence by inoculating colonies of bees. "Growth in culture was obtained from spores boiled in water or exposed to flowing steam for 7 hr., boiled in diluted honey for 5 hr., autoclaved at 15 lb. for 25 or 40 min., exposed to dry heat at 98° for 2 days, and exposed in beeswax at 100° for 5 days. Spores boiled for 30 min. and fed to colonies had not produced disease after 3 yr., while spores boiled for 15 min. had not produced disease at the end of one season. A favorable medium, heavy inoculations, and prolonged incubation were found necessary to produce growth of spores subjected to severe heating. Extreme variation in cultural results with heated spores is thought to be due to variation in thermal resistance of individual spores."

**The nitrite nitrogen test for Bacillus larvae,** C. E. Burnside. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 405–408*).—Observations have shown that

the causative organism of the American foulbrood is not the only bacterial species that stores nitrite in medium containing carrot extract, but without added nitrate. "Two spore bearers with gross cultural and morphological characters distinct from those of *B. larvae* and from each other which store nitrite in the medium used for *B. larvae* were isolated and grown in pure culture. Both organisms gave positive nitrite tests indistinguishable from this test with cultures of *B. larvae*, and the nitrite remained stored in the medium for at least 6 weeks. Positive nitrite tests were also obtained with several other contaminated cultures, when vegetative cells of *B. larvae* were not detected by microscopical examination. While the nitrite test is convenient and a useful presumptive test for detecting slight growth of *B. larvae*, it is evident that the gross appearance of any growth as well as the morphology of the organism must be considered before the conclusion is reached that growth of *B. larvae* has occurred."

**The use of honeybees in cranberry bogs,** C. A. DOEHLERT. (N. J. Expt. Stas.). (*Amer. Cranberry Growers' Assoc., Proc. Ann. Mtg., 70 (1940), pp. 32–37*).

**Nectar secretion in poinsettia blossoms,** G. H. VANSELL. (U. S. D. A. and Univ. Calif.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 409, 410*).—In studies of nectar secretion in poinsettia blossoms, it became apparent that a number of factors were involved in the quantity secreted. Lowered temperature, diminution of light, reduced air pressure, and drought all caused a decrease in secretion, while an increase in the degree of saturation of the air resulted in nectar dilution. It is considered reasonable to assume that nectar production in other plants is also affected by numerous factors. Since insect activity on blossoms is influenced by the nectar secretion, investigation of this phenomenon should result in great benefit to seed, fruit, and honey producers.

**New equipment for heating honey,** E. J. ANDERSON. (Pa. State Col.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 410–415 figs. 4*).

**Biology of Calliephialtes dimorphus Cushm. (Hym.: Ichn.), an interesting primary parasite of Platyedra gossypiella (Saunders)** [trans. title], H. F. G. SAUER (*Arq. Inst. Biol. [São Paulo], 10 (1939), pp. 165–192, pl. 1, figs. 7; Eng. abs., pp. 190, 191*).—The ichneumonid *C. dimorphus*, recently described by Cushman (E. S. R., 81, p. 253) from specimens taken at Campinas, São Paulo, is a primary external parasite of the pink bollworm. It is said to be widely distributed in that State and to have also been found in the States of Minas Geraes, Rio de Janeiro, and Espirito Santo. It has been reported as parasitizing *Myelois decolor* Zeller and under laboratory conditions to parasitize and to develop to maturity on larvae of *Leucinodes elegantalis* Guen.

**Xorides indicatorius Latr. ? parasitic on Leiopus nebulosus L. and a list of other species of hymenopterous parasites of Coleoptera in Great Britain,** H. DONISTHORPE (*Entomologist, 73 (1940), No. 920, pp. 14–20*).

**A synopsis of the Neotropical mutillid genus Euspinolia Ashmead (Hymenoptera),** C. E. MICKEL. (Minn. Expt. Sta.). (*Rev. Ent., 9 (1938), pp. 53–74; abs. in Minnesota Sta. Rpt. 1939, p. 27*).—A systematic revision of the velvet ant genus *Euspinolia*. Eleven species are recognized, 7 of which are described as new.

**The Neotropical mutillid wasps of the genus Timulla (Hymenoptera: Mutillidae),** G. E. MICKEL. (Minn. Expt. Sta.). (*Roy. Ent. Soc. London, Trans., 87 (1938), pp. 529–680; abs. in Minnesota Sta. Rpt. 1939, p. 21*).—This is the first contribution toward a revision of monographs of the Neotropical genera of the velvet ants.

**Costs of control measures for the citrus rust mite,** M. R. OSBURN. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 393–396*).—Report is made of

the costs of sulfur spray and dust treatments for the control of the citrus rust mite in Florida as calculated from data collected over a period of 4 yr. from experimental plats in six orange groves. In general, control of rust mites and of russeting by dusting with sulfur ranged from 10 to 12 ct. per tree for dusted Valencia compared to 25 ct. per tree for the cheapest spray program with any of the ordinary spray combinations. "Addition of wettable sulfurs to lime-sulfur reduced the number of applications required in a season, but during a heavy rust mite year on Valencia trees a schedule employing lime-sulfur alone was cheaper, although an extra application was required. Generally, the addition of 5 lb. of wettable sulfur to lime-sulfur solution gave as good protection as the addition of 10 lb., and was cheaper. Dry lime-sulfur sprays were more costly than most of the other comparable spray treatments. Experimental procedure with all the above treatments gave commercial control of rust mites and prevented russeting of fruit equally well. Controlling rust mites increased fruit production, resulting in a profitable return, the increased return for Parson Brown oranges being 68 ct. per tree and for Valencias 50 ct."

**Control of the European red mite, with special reference to dinitro-o-cyclohexylphenol in dormant sprays,** J. M. Grayson. (Va. A. and M. Col.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 385–389*).—The details of experiments with dormant and delayed dormant sprays against the European red mite eggs at Winchester, and with dormant sprays against these eggs at Blacksburg, Va., are presented in two full-page tables. The ovicidal effectiveness of petroleum oil applied against the eggs of this pest was slightly increased by the addition of dinitro-*o*-cyclohexylphenol. "Sprays consisting of 2 percent petroleum oil and dinitro-*o*-cyclohexylphenol, in concentrations of not less than 8 oz. per 100 gal. of spray, in most cases gave control comparable to that obtained with 3 percent petroleum oil alone. Dinitro-*o*-cyclohexylphenol, when used as a wettable powder without petroleum oil, was ineffective as an ovicide. Water-gas tar oils and combinations of tar distillate and paraffin wax were ineffective. Sprays applied in December and January were not as effective against European red mite eggs as those applied in March or April. Satisfactory control of an outbreak of the European red mite was obtained in July by the application of 6 qt. of 83 percent summer oil emulsion per 100 gal."

## ANIMAL PRODUCTION

**The American Society of Animal Production: Record of proceedings of the thirty-second annual meeting, December 1–3, 1939** (*Amer. Soc. Anim. Prod. Proc., 32 (1939), pp. 488, figs. 32*).—This is a report of the annual meeting held at Chicago in 1939 (E. S. R., 81, p. 402). In addition to papers noted on page 391 and previously (E. S. R., 83, p. 178), the following were presented before the horses and mules, beef cattle, swine, sheep and wool, extension, meats, and nutrition sections:

Breeding and Development of Medium Weight Draft Horses, by R. S. Hudson and C. L. Cole (pp. 86–89) (Mich. State Col.); Horse Improvement by Conformation Standards, by J. G. Fuller (pp. 89–91) (Univ. Wis.); Feeding and Management of Thoroughbreds, by L. J. Horlacher (pp. 91–93) (Univ. Ky.); The Effect of Limited Feeding of Oats and Timothy Hay During Work on the Nitrogen Balance of Draft Geldings, by A. L. Harvey, B. H. Thomas, C. C. Culbertson, and E. V. Collins (pp. 94–103) (Iowa Expt. Sta.); How Much Fat Do Consumers Want in Beef? by A. L. Scott (pp. 103–107); Pasture Yield in Terms of Known Feed Equivalents, and Pasture in a Balanced System of Land Use, by L. E. Hawkins (pp. 107, 108); A Comparison of Permanent and Rotation Pastures

for Producing Meat Animals, by H. P. Rusk, W. L. Burlison, and R. R. Snapp (pp. 108–111) (Univ. Ill.); The Effect of Winter Weight Changes on Gains Made From Pastures by Beef Steers, by C. M. Kincaid (pp. 111–116) (Va. Sta.); A Comparison of Alfalfa Hay and Alfalfa-Molasses Silage as Roughages for Fattening Steers, by E. S. Good and W. P. Garrigus (pp. 116–119) (Univ. Ky.); Feeding Concentrates to Steers on Pasture, by M. G. Snell (pp. 119–121) (La. Sta.); A Study of the Accuracy of Scoring Certain Characters in Beef Cattle, by B. Knapp, Jr., W. H. Black, and R. W. Phillips (pp. 122–124) (U. S. D. A.); A Factual Basis for Changing Swine Types, by E. F. Ferrin (pp. 125–128) (Univ. Minn.); The Protein Requirements of the Young Pig, by T. B. Keith and R. C. Miller (pp. 128–132) (Pa. Sta.); An Attempt to Locate the Most Advantageous Percentage of Protein in the Ration of Growing-Fattening Pigs of Different Weights, by W. E. Carroll and W. Burroughs (pp. 132–136) (Univ. Ill. and Ohio Sta.); The Mineral Requirements of Pigs, by G. Bohstedt (pp. 137–144) (Univ. Wis.); Protein Requirements of Weanling Pigs—The Inter-relations Between the Protein Level of the Diet, the Amounts of Feed Consumed Daily, and the Rate of Gain of the Pigs, by E. W. Crampton (pp. 144–147) (see p. 384); Vitamin Requirements of Weanling Pigs, by E. H. Hughes (pp. 147–152) (Univ. Calif.); Nutritional Requirements of Weanling Pigs—Coordination and Summary, by H. H. Mitchell (pp. 152–156) (Univ. Ill.); The Deficiencies of Peanuts as a Feed for Swine, by W. G. Kirk (p. 156) (Fla. Sta.); Estimates of Means Differences Necessary for Significance Between Pigs in Group Feeding Experiments, by H. O. Hetzer and G. W. Brier (pp. 157–161) (U. S. D. A.); Preliminary Studies With Soybean Phospholipids for Sheep, by L. M. Harwood, S. S. Wheeler, and F. S. Hultz (pp. 164–170) (Wyo. Sta.); Production and Marketing of Western Feeder Lambs, by E. F. Rinehart (pp. 170–174) (Univ. Idaho); The Production and Marketing of Feeder Lambs in the Southwest, by J. M. Jones (pp. 175–180) (Tex. Sta.); The Problems of Finishing and Marketing Western Feeder Lambs, by D. S. Bell (pp. 181–184) (Ohio Sta.); Discussion of Paper on *Finishing and Marketing Western Feeder Lambs*, by W. G. Kammlade (pp. 185–187) (Univ. Ill.); The Compressed Volume of Raw Wool as an Indicator of Yield, by A. Johnston and J. Gray (pp. 188–194) (Wyo. Sta.); Getting the Most Out of Forage—Grazing Management, by T. A. Ewing (pp. 283–286) (Univ. Mo.); Silage From the Hay Crops, by T. E. Woodward (pp. 287–290) (U. S. D. A.); Range Forage Utilization, by A. L. Smith (pp. 290–297) (Tex. A. and M. Col.); The Relationship Between the Time of Freezing Beef After Slaughter and the Amount of Drip, by J. M. Ramsbottom and C. H. Koonz (pp. 303, 304) (E. S. R., 82, p. 806); Storing Beef Roasts and Steaks in Freezer Lockers, by W. H. Burkitt and H. Hackedorn (pp. 304, 305) (Wash. Sta.); The Effect of Different Wrappings, Temperatures, and Length of Storage on Keeping Qualities of Frozen Pork Chops, by R. M. Griswold and L. H. Blakeslee (pp. 305–314) (Mich. Sta.); Fat in Relation to Quantity and Quality Factors of Meat Animal Carcasses, by O. G. Hankins and N. R. Ellis (pp. 314–319), and Relationships of Flavor and Juiciness of Beef to Fatness and Other Factors, by N. G. Barbella, B. Tannor, and T. G. Johnson (pp. 320–325) (both U. S. D. A.); Consumer Attitudes Toward Government Grade-Stamped and Packer-Branded Beef, by R. C. Ashby, S. Bull, and E. C. Hedlund (pp. 329–332) (Univ. Ill.); Pasture Studies—XVI, The Nutritive Values of Kentucky Blue Grass, Red Top, and Brome Grass, With Particular Reference to the Relation Between the Chemical Composition of the Herbages and the Live Weight Gains Made by the Animals Subsisting Thereon, by E. W. Crampton and R. Forshaw (pp. 375, 376) (see p. 383); Effects of Diet Oil on Body Fat of Different Species, by F. R. Edwards and K. T. Holley (pp. 376–383) (Ga. Sta.); Studies on the Requirements of

Herbivora for Nicotinic Acid and Grass Juice Factor, by A. H. Winegar and P. B. Pearson (pp. 384–389) (Tex. A. and M. Col.); Rumen Digestion Studies, by E. B. Hale, C. W. Duncan, and C. F. Huffman (pp. 389–393) (Mich. Sta.); Relation of Diet to a Type of Leg Weakness in Swine Induced by Nerve Degeneration, by N. R. Ellis and L. L. Madsen (pp. 393, 394) (U. S. D. A.) (E. S. R., 77, p. 672); Measuring the Relative Net Energy Values of Alfalfa Hay and Cane Fodder, by F. H. Leinbach (pp. 394, 395) (Univ. Md.); Energy Values of Corn Bran, Rice Polish, Rice Bran, and Rye Flour as Measured by Experiments on Baby Chicks, by G. S. Fraps and E. C. Carlyle (pp. 396–399) (Tex. Sta.); The Digestibility of Animal Products and Cereals by Minks, by J. K. Loosli and L. A. Maynard (pp. 400–403) (Cornell Univ. coop. U. S. D. A.); The Value of Urea as a Protein Supplement Replacement for Dairy Heifers, by S. H. Work and L. A. Henke (pp. 404–406) (Hawaii Sta.); A New Technique for Limited Feeding Experiments, by W. Burroughs and W. E. Carroll (pp. 407–412) (Univ. Ill.); Recent Advances in Protein Nutrition, by F. B. Morrison (pp. 413–425) (Cornell Univ.); Recent Advances in Vitamin Nutrition, by W. E. Krauss (pp. 425–435) (Ohio Sta.); Animal Fats, by G. O. Burr (pp. 435–438) (Univ. Minn.); and The Chemistry of Curing Meat, by D. A. Greenwood, H. V. Griffin, and W. L. Lewis (pp. 439–448).

**[Livestock investigations in Wisconsin]** (*Wisconsin Sta. Bul. 449 (1940), pp. 86–94, fig. 1*).—Studies for which results are reported deal with mineral requirements of pigs, including sources of lime, by G. Bohstedt, J. M. Fargo, W. A. King, and O. B. Ross; chopping hay for cattle, by R. C. Fischer, F. W. Duffee, and Bohstedt; relative carrying capacity for grazing of timbered and clear pasture, by O. E. Hays and Bohstedt; advantages of liberal amounts of animal protein in early broiler production, by J. G. Halpin, C. E. Holmes, and W. W. Cravens; value of infertile eggs in chick rations, by Halpin, M. H. Meshew, and Holmes; vitamins in breeding rations, irradiated yeast for poultry, and effect of manganese on hatchability, all by Halpin, Holmes, and Cravens; sulfur feeding unsafe in winter, by Halpin, Holmes, and C. A. Herrick; and injury to chicks by boric acid, by M. I. Wegner, Cravens, and Halpin.

**The preventive effect of wheat germ oils and of α-tocopherol in nutritional muscular dystrophy of young rats**, M. Goettsch and J. Ritzmann (*Jour. Nutr., 17 (1939), No. 4, pp. 371–381*).—By maintaining young female rats on a basal diet of casein, cornstarch, lard, and a salt mixture, supplemented with dried bakers' yeast and cod-liver oil, severe muscular dystrophy was induced in about 90 percent of the individuals by the end of the lactation period, even though a sufficient quantity of wheat-germ oil was administered to permit normal reproduction. This disorder was prevented by supplementing the diet with wheat-germ oil, oil of treated wheat germ in which the antisterility vitamin had been inactivated by an ethereal ferric chloride, or with α-tocopherol. The potency of the preparation in preventing muscular dystrophy did not necessarily correspond to its antisterility potency.

**The cure of nutritional muscular dystrophy in the rabbit by alpha-tocopherol and its effect on creatine metabolism**, C. G. Mackenzie and E. V. McCollum (*Jour. Nutr., 19 (1940), No. 4, pp. 345–362, figs. 4*).—A detailed report of research previously noted (E. S. R., 81, p. 557).

**Fractionation of the factor preventing nutritional achromotrichia**, E. Nielsen, J. J. Oleson, and C. A. Elvehjem. (Univ. Wis.). (*Jour. Biol. Chem., 133 (1940), No. 2, pp. 637, 638*).—Announcement is made of the production of a crystalline material from a chloroform extract of liver extract material. These crystals proved highly potent in preventing achromotrichia in piebald rats. The factor involved is apparently distinct from the well recognized members of the vitamin B complex.

**The relation of the vitamin B complex to the nutrition of domestic animals,** A. Arnold and C. A. Elvehjem. (Univ. Wis. et al.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 754, pp. 56–61*).—A brief résumé.

**The relation between factor U and vitamin $B_6$,** E. L. R. Stokstad, P. D. V. Manning, and R. E. Rogers (*Jour. Biol. Chem., 132 (1940), No. 1, pp. 463, 464*).—A preliminary report of experiments with chicks on simplified diets indicates that factor U (E. S. R., 80, p. 814), a chick-growth factor contained in yeast, is not identical with vitamin $B_6$.

**Effect of yeast extract and other supplements on the growth of chicks fed simplified diets,** T. H. Jukes. (Univ. Calif.). (*Jour. Biol. Chem., 133 (1940), No. 2, pp. 631, 632*).—A preliminary report of experiments with chicks on simplified diets confirms the above-described observation of the presence in yeast of a growth-promoting factor distinct from the five known members of the vitamin B complex. The factor is destroyed by nitrous acid and is somewhat labile to autoclaving.

**Pastures studies.—XVI, The nutritive values of Kentucky blue grass, red top, and brome grass, with particular reference to the relation between the chemical composition of the herbages and the live weight gains made by the animals subsisting thereon,** E. W. Crampton and R. Forshaw (*Jour. Nutr., 19 (1940), No. 2, pp. 161–172*).—Continuing this series of investigations (E. S. R., 82, p. 228), the nutritive value of artificially dried grass clippings, obtained from previous studies of bromegrass, Kentucky bluegrass, and redtop at approximately 16-day intervals during a growing season, was determined by ad libitum feeding of these samples to rabbits. Data are presented on the chemical composition of the herbage and on the feed consumption and growth of the rabbits. In general, the herbage grown during the spring and fall was of excellent feeding value, while that produced during midsummer was of lower nutritive value, due apparently to a reduction in the availability of the carbohydrate fractions. Analysis of the data, using partial and multiple correlations, indicates that simple correlations between growth of the animals and the fractions of the usual feeding stuffs analysis may frequently be misleading when interpreted in the sense of cause and effect. Specifically, variations in crude fiber, although showing a rather high simple correlation with live weight gains, probably have only minor effects on gains. Protein content was highly correlated with gains in weight, but it appeared that protein as such was never a limiting factor in the growth-promoting value of immature herbage, but rather that increases in protein represented merely increases in available energy.

**The viability of seeds as affected by the siloing process,** T. E. Woodward. (U. S. D. A.). (*Jour. Dairy Sci., 23 (1940), No. 3, pp. 267–271*).—In the tests reported, 22 lots of seeds (mostly weeds) were buried in corn, grass, and alfalfa silages of varying moisture and acid content. Germination tests revealed that the viability of seeds of most of these species was entirely destroyed, while check samples held in dry storage showed varying degrees of viability. It is concluded that the conversion of weedy crops into silage instead of into hay will help materially in the control of weeds.

**Digestibility studies with ruminants.—VII, Plane of nutrition and digestibility on a hay-oil cake ration,** C. J. Watson, J. A. Campbell, W. M. Davidson, C. H. Robinson, and G. W. Muir (*Sci. Agr., 20 (1940), No. 8, pp. 458–469*).—Continuing this series of investigations (E. S. R., 82, p. 659), Shorthorn steers were used in a series of experiments to determine the digestibility of a ration composed of equal parts of hay and oil cake at five different levels of feeding, ranging from 2 kg. per head daily to ad libitum consumption. The digestibility

of the total carbohydrates of the ration and the total digestible nutrients in the dry matter decreased progressively at a significant rate from the lowest to the highest level of feeding. The digestibility of the noncarbohydrate fraction of the organic matter did not change materially as the level of feeding increased. Protein was somewhat more efficiently digested in the middle ranges of feeding than at either extreme, while the values for ether extract were practically constant throughout.

**Beef cattle investigations, 1938–39,** C. W. McCampbell and L. C. Aicher (*Kansas Sta., Fort Hays Substa., Beef Cattle Invest., 1938–39, pp. 8*).—This is the fourth and final report of two series of tests (E. S. R., 81, p. 91).

I. *The comparative values of eight protein supplements in winter rations for stock cattle.*—The 1938–39 trials tended to substantiate earlier findings. A summary of 3 years' results with yearlings indicated that those receiving 3 lb. of wheat bran per head daily as a supplement to sorghum silage consistently made greater and less costly gains than those receiving a supplement of 4 lb. of ground alfalfa hay or 1 lb. of a protein-rich supplement daily. The alfalfa hay ranked second on the basis of average total gain, followed in order by cottonseed meal, corn gluten meal, soybean oil meal, tankage, linseed meal, and peanut meal. Cost per hundredweight of gain with the various supplements varied with varying feed costs.

II. *Wheat bran versus alfalfa hay versus cottonseed meal as protein supplements to silage when these combinations are used as winter rations for stock cattle: Calves.*—In an attempt to ascertain the quantity of alfalfa hay or wheat bran which was equivalent to 1 lb. of cottonseed meal as a supplement to sorghum silage for wintering beef calves, eight groups received the following respective supplements: 3 lb. and 4 lb. of long alfalfa, 3 lb. and 4 lb. of ground alfalfa, 3, 2, and 1 lb. of wheat bran, and 1 lb. of cottonseed meal per head daily. The average daily gains were 0.99, 1, 0.95, 0.98, 1.13, 0.91, 0.68, and 0.96 lb. for groups 1 to 8, respectively.

**Feeding range lambs in Kansas,** R. F. Cox (*Kansas Sta. Bul. 287 (1939), pp. 80, figs. 46*).—A practical discussion of range lamb feeding problems. The principal topics of discussion are size, quality, and type of feeder lambs; obtaining feeder lambs; equipment for feeding: feeds and methods used in fattening; feed-lot management; and shipping lambs.

**Protein requirements of weanling pigs: The inter-relations between the protein level of the diet, the amounts of feed consumed daily, and the rate of gain of the pigs,** E. W. Crampton (*Sci. Agr., 20 (1940), No. 8, pp. 453–457*).—Based on a statistical analysis of data on the growth rate of pigs receiving different levels of feeding and also rations of varying protein content, it is shown that, within a given level of daily feed consumption, increasing the percentage protein of the ration resulted in increased gain, but increased gain also resulted from increased feed intake at a given level of protein intake. Thus it appears that protein requirements determined by any method are inseparably linked with average daily feed consumption, and that due allowance for various levels of total feed intake must be made in any workable feeding standard. The shortcomings of any practical feeding standard in which a fixed biological value of the protein is assumed in arriving at the requirement are stressed.

**The feeding value of western Canadian barley for bacon hogs** (*Ottawa: Dominion Dept. Agr., [1939], pp. [3]+70, fig. 1*).—This second interim report (E. S. R., 80, p. 812) summarizes the results of the 1938 uniform feeding trials replicated at four experiment stations in Nova Scotia, Quebec, and Ontario. The principal objectives of these trials were to determine the effect on the

feeding value of pure barley of the presence of wild oats and weed seeds in amounts typical of those found in samples grading No. 1, No. 2, and No. 3 Canadian western feed barley. Two check groups received yellow corn and a mixture of equal parts of No. 2 Canadian western barley and No. 3 Canadian western oats, respectively. In all cases the rations contained 15 percent of a mixed protein supplement until the pigs weighed 110 lb., and 10 percent thereafter. The No. 1 barley (3 percent wild oats plus 1 percent weed seed) and No. 2 barley (7 percent wild oats and 2 percent weed seed) were approximately equal in feeding value but superior to either the yellow corn or the barley-oat mixture as a bacon hog feed. The No. 3 barley (17 percent wild oats plus 3 percent weed seeds) was lower than the No. 1 or No. 2 barley and similar to the barley-oat mixture in feeding value. It is concluded that high-grade barley is to be rated above corn for bacon production whether measured by rate of gain or carcass excellence. An appendix, giving the data, is included.

**The feeding value of Canadian western barley for bacon hogs,** E. W. Crampton, G. W. Muir, and R. G. Knox (*Sci. Agr., 20 (1940), No. 7, pp. 365–401, figs. 6*).—A report of the research described above.

**Value of sugar-beet molasses in feeding of young hogs questioned,** H. Smith (*Farm and Home Sci. [Utah Sta.], 1 (1940), No. 1, pp. 5, 11, fig. 1*).—In an experiment with pigs having an initial weight of approximately 50 lb., comparing a basal ration of barley, tankage, and alfalfa with the basal ration when supplemented with 25, 50, and 75 percent of beet molasses, it was found that the addition of molasses at any of these levels resulted in slower and more costly gains than were obtained with the control ration. Also death losses were higher on the molasses-supplemented rations. Similar trials with pigs having an initial weight of over 100 lb. indicated that the larger pigs can utilize molasses to a better advantage than the smaller ones.

**Factor II deficiency in dogs,** P. J. Fouts, O. M. Helmer, and S. Lepkovsky. (Univ. Calif. et al.). (*Jour. Nutr., 19 (1940), No. 4, pp. 393–400*).—Seven adult dogs weighing from 7.1 to 9.4 kg. were maintained on a synthetic diet containing casein, sucrose, Crisco, bone ash, and salt and supplemented with thiamin chloride, riboflavin, nicotinic acid, and rice polish extract containing factor I or crystalline factor I. Following a preliminary gain in weight on this diet, all dogs developed pronounced deficiency symptoms characterized by loss of weight, loss of appetite, diarrhea of an intermittent character, skin ulcers (in short-haired dogs only), anemia, and coprophagy. The dogs eventually died, death occurring after from 87 to 289 days on the experimental diet. No evidence of derangement of the central nervous system was observed. It was not determined whether the deficiency described was due to a lack of factor II (chick antidermatitis factor) alone or to the lack of this and other yet unidentified components of the B complex.

**[Contributions on nutrition and incubation; economics, including marketing; public service and general; and poultry products research]** (*7. World's Poultry Cong. and Expo., Cleveland, 1939, Proc., pp. 122–214, 304–462, 466–551, figs. 85*).—The following papers were presented in these sections:

*Nutrition and incubation.*—Progress in Poultry Nutrition, by R. M. Bethke (p. 122) (Ohio Expt. Sta.); Vitamin A Requirements of Poultry, by R. M. Sherwood (pp. 123–126) (Tex. Sta.); Vitamin B Complex in Relation to the Nutrition of the Chick and Pigeon, by C. W. Carter and J. R. O'Brien (pp. 126–128); A Method for the Quantitative Estimation of Vitamin D With Growing Chicks, by N. Olsson (pp. 129–132); Recent Research on the Etiology and Treatment of Rickets in Chickens, by G. Nichita, N. Tuschak, and I.

Popesco (pp. 132–136, Eng. abs. p. 136); Phosphorus Metabolism in Normal and Rachitic Chickens With a Radioactive Phosphorus Isotope as an Indicator, by M. J. L. Dols (pp. 136–138); Properties of Vitamin K, by H. J. Almquist (pp. 138–141) (Univ. Calif.); Protein Requirements of Chicks, by J. S. Carver, V. Heiman, E. I. Robertson, and J. W. Cook (pp. 141–145) (Wash. State Col.) (E. S. R., 82, p. 666); Some Observations on the Protein Requirements of the Laying Fowl, by E. T. Halnan (pp. 145–148); Comparative Studies of the Most Important Animal Protein Feeding Stuffs, by E. Lauprecht (pp. 148–151, Eng. abs. pp. 150, 151); Investigation of Improved Poultry Feeding in Bulgaria, by I. J. Tabakoff (pp. 151–153); Potatoes and Skim Milk as Feed for Laying Hens, by I. Finne (pp. 153–157); Rearing With Home-Grown Feeding Stuffs, by H. Müller (pp. 157–159, Eng. abs. p. 159); Experiments on Utilization and Nutritive Value of Home-Grown Feeding Material, by E. Mangold (pp. 159–165, Eng. abs. pp. 164, 165); The General Nutritive Value (Energy Value) of Poultry Feed, by J. J. Axelsson (pp. 165–167); Review of Investigations in the Bureau of Animal Industry on Energy and Gaseous Metabolism of the Domestic Fowl, by H. G. Barott and E. M. Pringle (pp. 167–171) (U. S. D. A.); The Role of Manganese in Poultry Nutrition, by H. S. Wilgus, L. C. Norris, and G. F. Heuser (pp. 171–174) (Colo. Sta. and Cornell Univ.); Necessity for an Organic Dietary Factor and for Insoluble Grit in the Development of the Gizzard Lining in Chicks, by H. R. Bird, J. J. Oleson, C. A. Elvehjem, E. B. Hart, and J. G. Halpin (pp. 174–177) (Wis. Sta.); Cereals in the Fattening Ration, by W. A. Maw (pp. 177, 178); Trends of Research in Incubation, by J. H. Martin (p. 179) (U. S. D. A.); Influence of Temperature on Length of Artificial Incubation Period of *Gallus domesticus*, by E. W. Henderson (pp. 180–184) (Iowa Sta.); Effect of Temperature Shock on Development of Chick Embryo, by A. L. Romanoff (pp. 184–186) ([N. Y.] Cornell Sta.); An Experimental Study on the Effects of Storage on Embryonal Development of Hens' Eggs, by L. Kaufman (pp. 186, 187); Development of the Unincubated Chick Embryo in Relation to Hatchability of the Egg, by L. W. Taylor and C. A. Gunns (pp. 188–190) (Univ. Calif.); Effect of Interior Quality of Eggs on Their Hatchability, by L. A. Wilhelm (pp. 191–194) (Wash. Sta.); Influence of Some Protein Supplements on Hatchability, by J. B. Smith and H. D. Branion (pp. 195–198); *Nutritional Factors in Relation to Hatchability*, by H. W. Titus (pp 198–201) (U. S. D. A.); Silage Feeding to Laying Hens, by E. Carbone (pp 202, 203); Preliminary Experiments on the Nutritive Value of the Contents of the Rumen on the Growth of Chickens, by F. Usuelli and P. Fiorini (pp. 203–205); Effect of Fiber and Bulk in the Diet of Chickens on Their Growth and on the Prevention of Feather Picking and Cannibalism, by E. J. Sheehy (pp. 205–209); Utilization of Citrus Meal for Poultry, by N. R. Mehrhof and L. L. Rusoff (pp. 209–212) (Fla. Sta.); and Importance of Fishery Byproducts in Poultry Nutrition, by J. R. Manning (pp. 212–214).

*Economics, including marketing.*—Research in Economic Phases of the Poultry Industry, by G. W. Sprague (pp. 304, 305) and The American Poultry Industry, by R. C. Potts (pp. 305–308) (both U. S. D. A.); Factors Affecting Profits on Commercial Poultry Farms, by E. G. Misner (pp. 308–311) (Cornell Univ.); The Place of the Poultry Enterprise in the (Corn Belt) Farm Business, by L. G. Allbaugh (pp. 312–318) (Iowa Sta.); The Centralization of Egg Export in Estonia, by R. Allman (pp. 318, 319); The Egg and Poultry Situation in Canada, by W. A. Brown (pp. 320–322); The Influence of Variations in Sectional Economic Maturity on Agricultural Husbandry, Particularly on Poultry, by L. C. Parsons (pp. 322-325); The Regulation of Egg Marketing in Germany, by F. Küthe (pp. 325–328, Eng. abs. pp. 327, 328); The Marketing of Eggs in

England and Wales, by C. A. Flatt (pp. 328–331); The Egg Standardization and Grading Program in Ohio, by R. C. Wiseman (pp. 331–334); Methods and Costs of Marketing Iowa Poultry and Eggs, by A. D. Oderkirk (pp. 334–345) (Iowa State Col.); An Economic Analysis of Cooperative Poultry Marketing in the United States, by J. J. Scanlan (pp. 345–349); An Economic Analysis of Cooperative Egg Marketing, by J. M. Gwin (pp. 350–352) (Md. Sta.); Services to Poultry Producers' Marketing Associations by the Farm Credit Administration, by T. G. Stitts (pp. 353–357); Retailing Government Graded Eggs in Ohio, by R. E. Gray (pp. 357–360) (Ohio State Univ.); The Commercial Hatchery Industry in the United States, by B. H. Bennett and C. C. Warren (pp. 360–364), Economic Aspects of the Frozen-Egg Industry in the United States, by J. H. Radabaugh (pp. 364–367), and Evisceration and Quick Freezing of Poultry in the United States, by T. W. Heitz (pp. 368–370) (all U. S. D. A.); Purpose and Technic of the Creation of Reserves in Eggs and Table Poultry, by A. Lange (pp. 371–373, Eng. abs. pp. 372, 373); Mercantile Exchanges in the Poultry and Egg Industries, by L. S. Tenny (pp. 373–375); Trends in International Trade in Poultry and Eggs, by L. A. Wheeler (pp. 376–380) (U. S. D. A.); Economic Services Provided the Poultry and Egg Industry by Government and Private Agencies, by J. R. Hawkinson (pp. 381–385); Factors Affecting Profits and Losses on Storage Shell Eggs, by S. W. Russell and G. D. Humphrey (pp. 385–391); Egg Prices in England, by O. J. Beilby (pp. 391–395); Habits in Consumption of Eggs in New York City, by L. F. Knudsen and F. L. Thomsen (pp. 395–400) (U. S. D. A.); and The Improvement of National and International Poultry Statistics, by J. C. Marquis (pp. 400–402).

*Public service and general.*—Advancing the Poultry Industry, by L. E. Card (p. 403) (Univ. Ill.); Federal Inspection of Dressed Poultry for Condition and Wholesomeness, by C. E. Edmunds (pp. 403–406) (U. S. D. A.); Organization and Accomplishments of the Poultry Health Service in Germany, by F. Weissgerber (pp. 406–410, Eng. abs. pp. 409, 410); Governmental Proceedings for the Improvement of Poultry Breeding in Hungary, by A. Horn (pp. 410–413); The Part Played by Women in the Poultry Industry in Great Britain, by E. E. Kidd (pp. 413–415); The Poultry Industry in Denmark, by W. A. Kock (pp. 415–417); The Poultry Industry in Estonia, by E. Liik (pp. 417–420, Eng. abs. p. 420); A Coordinated Breeding and Pullorum-Control Program for the United States—The National Poultry Improvement Plan, by P. B. Zumbro (pp. 420–425) (U. S. D. A.); Organization and Results of the Advisory System for Agricultural and Small-Scale Poultry Keeping in Germany, by J. Münichsdorfer (pp. 425–428, Eng. abs. pp. 427, 428); Organization and Control of Poultry Breeding, by H. Salzwedel (pp. 428–431, Eng. abs. pp. 430, 431); Effect of Environment on the Expression of Resistance and Susceptibility to Disease in the Domestic Fowl, by E. Roberts, J. M. Severens, and L. E. Card (pp. 431–434) (Univ. Ill.); Pullet Mortality and Its Economic Significance, by S. Bird (pp. 434–437); The Origin of the European "Dunghillcock," by J. B. Vries (pp. 437–440); Poultry Rearing in Norway—Organization and Marketing, by L. Svendsen (pp. 440–443); Studies on Individual Layers, by D. C. Kennard and V. D. Chamberlin (pp. 443–448) (Ohio Sta.); Squab Chickens—An Outlet for Excess Cockerels, by P. J. Schaible, R. M. Griswold, J. A. Davidson, and S. L. Bandemer (pp. 448–452) (Mich. Sta.) (see p. 388); The Egg Weight in Its Relation to Its Components, by J. Podhradský (pp. 453–455, Eng. abs. p. 455); Breeding Arrangements for Poultry Farming in the Netherlands, by J. G. Tukker (pp. 455–459); Existence of Chickens in America Before Its Discovery and Conquest, by S. Castelló (pp. 459–462); Effect of Restricting the Cereal

Diet of Pigeons to Corn and Wheat, by C. S. Platt (pp. 466–468) (N. J. Stas.); Feed Requirements of Rabbits, by G. S. Templeton (pp. 468–471) (U. S. D. A.); The Digestibility of Feeding Stuffs With Rabbits, by H. Brüggemann (pp. 471–473, Eng. abs. p. 473); and Outline of the Feeding of Rabbits in Germany, by R. Faugauf (pp. 473–476, Eng. abs. p. 476).

*Poultry products research.*—Introduction, by P. F. Sharp (pp. 477, 478) (Cornell Univ.); The Permeability of the Egg-shell for Bacteria, and Their Importance for Cool Storage, by H. Rievel (pp. 478–483, Eng. abs. p. 483); Breeding for Meat and Egg Production, by E. A. Lloyd (pp. 483–487); Bacterial Contamination of Frozen Whole Eggs and an Improved Method of Defrosting, by D. S. Brownlee and L. H. James (pp. 488–492) (Univ. Md.); The Profitable Utilization of Soiled Shell Eggs, by E. M. Funk (pp. 492–495) (Univ. Mo.); Luminescence Test for Eggs, by O. Grini (pp. 496–498); Operating Problems and the Scientific Approach to Their Solution, by H. J. Reynolds (pp. 498–500); Effect of Drawing Before Freezing on the Palatability of Poultry, by B. Lowe (pp. 500–505) (Iowa State Col.); Problems Arising During Holding of Poultry Prior to Evisceration and Freezing, by J. T. R. Nickerson and G. A. Fitzgerald (pp. 505–509); Effect of Time and Temperature of Holding Undrawn Poultry Upon Its Quality, by G. A. Fitzgerald and J. T. R. Nickerson (pp. 509–512); Precooling, Freezing, and Storage of Dressed Poultry, by W. H. Cook (pp. 512–516); Temperature and Humidity in the Short-Time Holding of Eggs, by A. Van Wagenen, G. O. Hall, and M. Altmann (pp. 516–521) (Cornell Univ. et al.); Factors Affecting Interior Egg Quality, by L. A. Wilhelm (pp. 521–524) (Wash. Sta.); Unit for Measuring Egg Storage Conditions, by R. R. Haugh (pp. 525–528); Changes in Ovomucin During Egg Storage, by R. M. Conrad and H. M. Scott (pp. 528–530) (Kans. Sta.); The Application of Interior Egg Quality Measurements to Practical Problems, by S. R. Hoover and C. Rogers (pp. 530–534) (U. S. D. A. et al.); Influence of Starch on the Deposition and Composition of Chicken and Egg Yolk Fat, by G. D. Buckner, W. M. Insko, Jr., J. H. Martin, and A. Harms (pp. 534, 535) (Ky. Sta.); Factors Affecting the Market Quality of Poultry Meat, by W. A. Maw (pp. 535–539); The Effect of Cod-liver Oil and Fishmeal on the Flavor of Poultry Products, by E. M. Cruickshank (pp. 539–542); Flavor of Turkey Meat as Affected by Feeding Fishmeal and Fish Oil, by R. R. Murphy, R. V. Boucher, and H. C. Knandel (pp. 542–545) (Pa. Sta.); Scientific Fattening of Young Poultry, by F. Lehman (pp. 546–548, Eng. abs. p. 548); and The Scientific Fattening of Ducklings, by K. Richter and E. Bizer (pp. 549–551, Eng. abs. p. 551).

Papers presented in other sections of the congress (E. S. R., 81, p. 465; 82, p. 94) have been noted (E. S. R., 82, pp. 257, 466).

**Squab chicken,** P. J. Schaible, R. M. Griswold, J. A. Davidson, and S. L. Bandemer. (Mich. Expt. Sta.). (*Poultry Tribune, 45 (1939), No. 8, pp 6, 13, figs. 3*).—Suggestions are offered for preparing and serving small chickens (from 1 to 1.25 lb.).

**Studies on the saliva of the hen,** E. E. Leasure and R. P. Link. (Kans. State Col.). (*Poultry Sci., 19 (1940), No. 2, pp. 131–134*).—Employing an operative technic, as described, samples of saliva were obtained from 30 mature hens of several breeds. The saliva was a milky gray to clear fluid, generally acid in reaction, and having an average specific gravity of 1.0135. It had a characteristic putrid acidlike odor and contained varying amounts of debris, cellular exudate, mucin, micro-organisms, and fat droplets. The enzyme amylase was always present, lipase was present but relatively inactive, proteinase was negligible in quantity or entirely absent, and salivary rennin was never present.

**Effect of substituting peanut meal in part for the animal protein in laying mash on egg production, hatchability, and livability of chicks,** R. S. Dearstyne, C. O. Bollinger, and H. P. Brigman (*North Carolina Sta. Bul. 326 (1940), pp. 10*).—In the first test conducted, three experimental mash rations were prepared in which peanut meal replaced fish meal, meat scrap, and dried skim milk, respectively, in a North Carolina State laying-mash (control) ration. In trials with Rhode Island Red pullets extending from November to July, egg production was higher on each of the test rations than on the control ration. The percentage fertility of eggs was only slightly lower on the test rations than on the control, and the hatchability of fertile eggs was similar for all groups. The percenage mortality of chicks was slightly, though not significantly, higher from parent stock on the test rations.

In a second trial, the three experimental rations contained higher levels of peanut meal than in the first series, and only one source of animal protein (either fish meal, meat scrap, or dried skim milk) was included in each mixture. In trials extending from October to June, egg production was practically equal on the three experimental rations, each falling slightly below that on the control ration. Fertility and hatchability were not adversely affected by the high level of peanut meal feeding.

**Availability of manganese in natural and precipitated manganese carbonate,** S. L. Bandemer, J. A. Davidson, and P. J. Schaible. (Mich. Expt. Sta.). (*Poultry Sci., 19 (1940), No. 2, pp. 116–125, figs. 6*).—In further studies (E. S. R., 80, p. 241) to determine the reason for the divergent effects of the natural ore (rhodochrosite) and precipitated manganese carbonate against perosis in chicks, the precipitated carbonate at 30 p. p. m. in the ration prevented perosis in feeding tests while the ore in very finely ground form at levels up to 125 p. p. m. proved unsatisfactory. On equilibration with acid, the soluble manganese of the rations containing the ore was much less than of those containing the precipitated carbonate. The ore when roasted or dissolved in acid became an effective preventive of perosis, and the addition of known impurities of the ore to precipitated manganese carbonate did not reduce its effectiveness. Excess of certain minerals known to be perosis-producing reduced the soluble manganese in the natural ore to a greater percentage than in the precipitated carbonate. Methods for the determination of manganese and for the differentiation of the ore from precipitated manganese carbonate are offered.

**The effect of grass silage on color of egg yolk,** C. L. Gish, L. F. Payne, and W. J. Peterson. (Kans. Expt. Sta.). (*Poultry Sci., 19 (1940), No. 2, pp. 154–156*).—During the laying year a group of White Leghorn pullets successively received as green feed immature oatgrass, molasses oatgrass silage, immature oatgrass, and Sudan grass. Darker yolk color was oberved when hens were fed the silage as compared with the fresh cereal grasses. "Grass eggs" were produced by 45.9 percent of the hens receiving the silage. A total of 30.1 percent of all eggs laid by hens producing grass eggs, or 13.3 percent of all eggs produced on the silage ration, were olive in varying degrees. The probable cause of grass eggs is discussed.

**Partial ovarian ablation concurrent with egg formation,** J. E. Parker and H. L. Kempster. (Mo. Expt. Sta.). (*Poultry Sci., 19 (1940), No. 2, pp. 157, 158, fig. 1*).—An unusual type of egg abnormality is described and illustrated.

**The use of stud-mating in poultry breeding,** W. C. Thompson (*New Jersey Stas. Hints to Poultrymen, 27 (1940), No. 2, pp. 4*).—Stud mating is recommended as a means for efficiently utilizing proved sires in poultry breeding. A method of handling stud mating is outlined.

**Efficiency in poultry meat production,** F. P. Jeffrey (*New Jersey Stas. Hints to Poultrymen, 27 (1940), No. 3, pp. 4, fig. 1*).—Based on data of the station and other sources, summaries are presented on the rate of growth and efficiency of meat production for White Leghorn, White Plymouth Rock, Barred Plymouth Rock, Red Rock, and Light Brahma breeds of chickens and for guinea males and turkeys.

**The effect of a riboflavin deficiency in the hen upon embryonic development of the chick,** R. W. Engel, P. H. Phillips, and J. G. Halpin. (Wis. Expt. Sta.). (*Poultry Sci., 19 (1940), No. 2, pp. 135–142, figs. 8*).—Two groups of year-old hens whose previous dietary histories had been identical were fed over a 7-mo. period (1) a riboflavin-deficient basal diet and (2) the basal diet plus 400 μg. of riboflavin per 100 gm. The four hens produced 227 and 384 eggs, respectively, during this period. The production of fertile eggs was 9 percent greater in the latter group. Embryonic mortality was 97.1 and 43 percent in groups 1 and 2, respectively, the majority of the embryonic deaths occurring during the first week in group 1 eggs, but during the second and third weeks in group 2 eggs. Among the surviving embryos, myelin sheath degeneration occurred in the sciatic nerve in about 60 percent of those from group 1 and in less than 10 percent of those from group 2. The injection of 50 μg. of riboflavin into the group 1 fertile eggs during the first day of incubation permitted the development of normal embryos. The daily oral administration of 50 μg. of riboflavin to hens receiving the basal diet rapidly resulted in the production of eggs of normal hatchability and also increased the riboflavin content of the egg albumin, which was markedly lowered during the period of riboflavin-deficient feeding. From 2½ to 3 μg. of riboflavin per gram of albumin was necessary in fertile eggs for the development of normal embryos. Embryos from the deficient group had less riboflavin in their livers than did those from the supplemented hens.

**The lipid content of blood, liver, and yolk sac of the newly hatched chick and the changes that occur in these tissues during the first month of life,** C. Entenman, F. W. Lorenz, and I. L. Chaikoff. (Univ. Calif.). (*Jour. Biol. Chem., 133 (1940), No. 1, pp. 231–241, figs. 5*).—Lipid determinations were made on the blood and liver of chicks ranging from 1 to 36 days of age. The livers of newly hatched chicks contained an average of 7.3 percent cholesterol (90 percent esterified) and 9 percent total fatty acids. After the third day the liver lipids declined rapidly, the esterified cholesterol reaching a low level after 10 days. This rapid fall was accompanied by a temporary rise in triglycerides. All lipid constituents were relatively high in the blood of newly hatched chicks, with a rapid decline noted after the third day. Yolk sacs of the newly hatched chicks contained about 12 percent fatty acids, 1.6 percent phospholipid, and 1.3 percent total cholesterol. Absorption was nearly complete when the chicks were 5 days of age.

**Care and management of baby chicks,** W. C. Thompson (*New Jersey Stas. Cir. 400 (1940), pp. 32, figs. 29*).—This supersedes Circular 247 (E. S. R., 65, p. 368).

**Requirements of chickens for vitamin A when fed as carotene,** R. M. Sherwood and G. S. Fraps (*Texas Sta. Bul. 583 (1940), pp. 21*).—Continuing this line of investigation (E. S. R., 76, p. 677), a series of experiments with growing chicks in which the level of carotene intake ranged from 50 to 175 μg. per 100 gm. of feed gave evidence that from 125 to 150 μg. are required for satisfactory health and growth of chicks to 12 weeks of age. There was no apparent difference in the effectiveness of carotene supplied in alfalfa meal or by crystalline carotene dissolved in oil. Similar trials with growing pullets

from 12 weeks of age to the onset of laying indicated a carotene requirement of from 150 to 175 μg. per 100 gm. of feed for this age group. Experiments with laying pullets indicated a requirement of not less than 450 μg. of carotene per 100 gm. of feed for optimum egg production and a requirement of 550 μg. or more for optimum hatchability of eggs. In order to provide a reasonable margin of safety, it is recommended that rations for growing chicks, growing pullets, and laying birds contain 180, 200, and 500 μg. of carotene per 100 gm. of feed, respectively.

**Turkeys affected with a bone deformity of the leg joints show a disturbance in the blood mineral ratios,** D. E. Madsen and H. M. Nielson (*Farm and Home Sci.* [*Utah Sta.*], *1* (*1940*), *No. 1, p. 7*).—Preliminary announcement is made of the occurrence of a disease in young turkeys characterized by a bony enlargement of the hock joint which is similar to, or identical with, perosis. Male poults were more commonly affected by this disorder than females. The addition of bonemeal to the ration tended to aggravate this condition. Abnormally low serum calcium and relatively high serum phosphorus were generally observed in affected birds.

## DAIRY FARMING—DAIRYING

**[Papers on dairy cattle in the 1939 proceedings of the American Society of Animal Production]** (*Amer. Soc. Anim. Prod. Proc., 32* (*1939*), *pp 44–80, figs. 5*).—In addition to papers noted on page 380 and previously (E. S. R., 83, p. 178), the following were presented before the dairy cattle section: The Effect of a Changing Economic Situation Upon the Future of Dairy Farming, by E. L. Anthony (pp. 44–48) (Mich. State Col.); The Place of Grade Dairy Cattle and of Purebred Dairy Cattle in Dairy Farming in the Future, by A. J. Glover (pp. 49–55); The Effects of Scientific Discovery Upon the Future of Dairy Farming, by E. B. Hart (pp. 56–60) (Univ. Wis.); Hay Drying Systems for Small Farms, by C. E. Wylie and J. A. Schaller (pp. 60–67) (Univ. Tenn. et al.); The Vitamin A Requirements for Normal Growth in Young Dairy Cattle, by H. T. Converse and E. B. Meigs (pp. 67–72) (U. S. D. A.); The Effect of Age and Dry Period on Production at Different Levels of Producing Ability, by G. E. Dickerson and A. B. Chapman (pp. 73–76) (Wis. Expt. Sta.); Some Recent Advances in the Knowledge of the Physiology of Milk Secretion, by W. E. Petersen and J. C. Shaw (pp. 77–80) (Univ. Minn.); and Factors Involved in the Ejection of Milk, by F. Ely and W. E. Petersen (p. 80) (Ky. Sta. and Univ. Minn.).

**Proceedings [of the] twenty-fifth annual meeting,, western division, American Dairy Science Association** (*Amer. Dairy Sci. Assoc., West. Div., Proc. Ann. Mtg., 25* (*1939*), *pp.* [*2*]+*50, fig. 1*).—The following papers are published in full for the meetings held at Portland, Oreg., October 8, 1939 (E. S. R., 81, p. 264): Cooling and Storing Cream for Butter Manufacture on Oregon Dairy Farms, by R. E. Stout and G. H. Wilster (pp. 14–22), Preliminary Report on Pasture Yields Obtained by Clippings at Intervals of One to Seven Weeks, by H. P. Ewalt and I. R. Jones (p. 23), and Wheat Germ Oil (Vitamin E) Injections for Difficult Breeding in Dairy Cows, by I. R. Jones (pp. 24–28) (all Oreg. Expt. Sta.); Demonstration as a Means of Developing Dairy Herd Improvement Associations, by G. E. Gordon (pp. 29–31) (Univ. Calif.); Vacreation of Cream for Butter, by G. H. Wilster (pp. 32–41) (Oreg. State Col.); The Influence of Temperature on the Keeping Quality of Cream, by D. R. Theophilus and N. Bue (pp. 42–46) (Univ. Idaho): and A Study of the Suitability of Making Bacterial

Counts by the Rolltube Method, by H. A. Bendixen and C. C. Prouty (pp. 47–50) (Wash. State Col.).

**Live weight and milk-energy yield in Holstein cows, W. L. Gaines.** (Ill. Expt. Sta.). (*Jour. Dairy Sci., 23* (*1940*), *No. 3, pp. 259–265, figs. 3*).—In further studies (E. S. R., 81, p. 265), the author has determined the ratio of milk-energy yield to initial weight from the records of a group of Holstein cows on a feeding experiment for three successive seasons and from the records of a group of daughters of one Holstein bull. These data gave further evidence that milk-energy yield tends to be a multiple of live weight and that the milk-energy yield per unit of live weight is independent of age. It is suggested that age correction is an indirect way of allowing for live weight.

**Dairy cattle in the Philippines, T. V. Rigor** (*Philippine Jour. Anim. Indus., 6* (*1939*), *No. 5, pp. 409–414*).—A brief résumé of the importation of foundation stock to the islands and a description of cross-breeding experiments now in progress.

**Feeding the dairy herd, W. B. Nevens** (*Illinois Sta. Cir. 502* (*1940*), *pp. [2]+32+[1], figs. 6*).—This supersedes Circular 440 (E. S. R., 74, p. 838).

**Goat's milk and its supervision, J. C. Marquardt.** (N. Y. State Expt. Sta.). (*Jour. Milk Technol., 2* (*1939*), *No. 6, pp. 280–285, figs. 4*).—The feeding of dairy goats; the composition, curd tension, quality, and utilization of goat milk; and the supervision and public health relationships of goat-milk production are each discussed.

**Evaluating quality in goat milk, J. C. Marquardt.** (N. Y. State Expt. Sta.). (*Dairy Goat Jour., 17* (*1939*), *No. 8, pp. 1, 3, 4*).—A general discussion.

**The effect of the new standard milk agar on the plate count of dairy products, F. E. Nelson.** (Kans. Expt. Sta.). (*Jour. Bact., 39* (*1940*), *No. 3, pp. 263–272, figs. 3*).—Thirty-eight samples of raw milk, 27 of pasteurized milk, 7 of pasteurized cream, and 32 of ice cream were plated on old standard nutrient agar, new standard nutrient agar, and tryptone-glucose-skim milk agar. Duplicate samples of each pouring were incubated at 37° and 32° C. The ratio of counts obtained on the new and old standard nutrient agars at 37° were 1.355, 1.816, and 1.345, and those on the new standard medium and tryptone-glucose-skim milk agar at 37° were 1.005, 1.055, and 0.998 for raw milk, pasteurized milk and cream, and ice cream, respectively. Except in the case of raw milk, the use of the improved agars tended to lessen the increase in count commonly observed when an incubation temperature of 32° was used instead of 37°. Colonies developing on the new standard nutrient agar were generally similar to those on tryptone-glucose-skim milk agar and were larger and more easily counted than those on the old standard medium. These findings definitely indicated the superiority of the new standard medium for the development of certain bacteria commonly found in milk.

**Oxidized flavor in milk.—I, Effect of the development of oxidized flavor on the iodine number of the phospholipid fraction of milk, A. M. Swanson and H. H. Sommer.** (Univ. Wis.). (*Jour. Dairy Sci., 23* (*1940*), *No. 3, pp. 201–208*).—Iodine number determinations were made on the phospholipid fraction and on the butterfat of both normal and oxidized milks. The development of oxidized flavor was accompanied by a marked decrease in the iodine number of the phospholipid fraction, while no significant difference was found to exist between the iodine number of butterfat in the normal and oxidized milk. It appeared that the development of oxidized flavor in milk catalyzed by copper is primarily due to oxidation of the phospholipid fraction. However, oxidation of the unsaturated fatty acid in this fraction was not complete, one molecule, probably oleic acid, remaining unoxidized.

**Effect of condensing on the development of oxidized flavor,** W. J. CORBETT and P. H. TRACY. (Univ. Ill.). (*Jour. Dairy Sci., 23 (1940), No. 3, pp. 209–214*).—Condensing pasteurized milk under vacuum to a concentration of approximately 2 : 1 rendered the condensed product or the condensed milk reconstituted to its original solids content entirely immune to the development of oxidized flavor, even in the presence of 3 p. p. m. of copper. Four percent fat milk prepared from the condensed skim milk and 32 percent cream was likewise immune to oxidized flavor development when 3 p. p. m. of copper was added. Samples removed from the vacuum pan after 15 and 30 min. of condensing were resistant, but not entirely immune, to the development of copper-induced oxidized flavor. The hypothesis is advanced that the effect of condensing in retarding oxidized flavor development is due to the liberation in the serum portion of the milk of certain antioxidative constituents which are probably derived from the milk protein.

**The influence of "white-metal" copper-nickel alloys on the flavor of milk,** J. L. HENDERSON and C. L. ROADHOUSE. (Univ. Calif.). (*Jour. Dairy Sci., 23 (1940), No. 3, pp. 215–220, figs. 2*).—In tests comparing seven copper-nickel alloys, data were obtained on the rate of corrosion of the metals and also the influence of the metals on the flavor of milk when strips were submerged in milk known to be susceptible to oxidized flavor development. Less copper went into solution from alloys containing tin and zinc, and the flavor of the milk was less influenced by such alloys than in those from which these elements were absent. The rate of ascorbic acid destruction was directly related to the amount of copper in solution, and this test proved a reliable index of the effect of the alloys on milk flavor. Nickel, lead, and zinc did not affect the oxidation of ascorbic acid nor cause oxidized flavor in milks pasteurized in contact with them.

**Water sorption of dry milk solids.—III, A comparison of results obtained by the cryoscopic, vapor pressure, and volume contraction methods,** E. L. JACK. (Univ. Calif.). (*Jour. Dairy Sci., 23 (1940), No. 3, pp. 221–226, fig. 1*).—Continuing this series of studies (E. S. R., 82, p. 243), comparative data were obtained for the degree of water sorption of dry milk solids as determined by the cryoscopic method of Newton and Gortner (E. S. R., 51, p. 26), the vapor pressure, and the volume contraction methods. Values by the cryoscopic method were highest and those by the vapor pressure method lowest for each sample. However, there was a qualitative agreement among the methods for the differently processed samples. It is the author's opinion that the values obtained by the volume contraction method are more nearly a correct measure of the degree of water sorption than by the other methods.

**Some factors responsible for variations in the acid numbers of the fat in cream and in commercial butter,** E. L. FOUTS. (Okla. A. and M. Col.). (*Jour. Dairy Sci., 23 (1940), No. 3, pp. 245–258*).—Continuing this line of investigation (E. S. R., 83, p. 104), it was found that micro-organisms were of greater significance than lipase in causing fat hydrolysis in raw cream and butter. In samples in which both micro-organisms and lipase were active, lipolysis was greater at 5° C. than at 13° or 21°; in samples in which micro-organisms were destroyed by formaldehyde, so that only lipase was active, the degree of hydrolysis increased as the holding temperature of the cream increased. Most organisms possessing lipolytic activity when inoculated into sterile cream caused an increase in the acid number of the fat, although rancidity did not always result. Acid-producing organisms markedly increased the titratable acidity of cream without causing changes in the acid number of the fat. Lipolytic organisms were much more active in cream than in butter, especially

at 5°. Neutralization of the acid in sour cream with alkali also reduced the acid number of the fat, though not proportionately.

**A method for calculating the Baumé reading of condensed ice cream mixes,** R. A. Larson and P. S. Lucas. (Mich. State Col.). (*Jour. Dairy Sci., 23 (1940), No. 3, pp. 229–244, figs. 4*).—Based on experiments with 12 ice cream mixtures of different composition which were condensed, analyzed, restandardized to desired composition, and their Baumé reading taken as standards, a method is described by which the Baumé hydrometer may be used as an accurate indicator of the composition of ice cream mixes during condensation and as a method for predicting when to strike the batch. By calculating additive density of a mix, using density values of 1.6129 for solids-not-fat, 1.6107 for sucrose, 1.5384 for gelatin, and the exact values for water and butterfat at the temperature at which the Baumé is to be read, then dividing by 100, and multiplying the result by the factor 0.949, for readings within a temperature range of from 120° to 135° F., a predicted density is obtained which when compared to Baumé gave an average density accuracy within 0.2° B.

**A bacteriological study of home-made ice cream,** V. D. Foltz. (Kans. State Col.). (*Jour. Bact., 39 (1940), No. 3, p. 345*).—Standard plate counts and presumptive tests for coliform bacteria on 100 samples of home-made ice creams showed logarithmic average plate counts of 171,000 per cubic centimeter and logarithmic average coliform counts of 70 per cubic centimeter. Samples frozen in tub freezers averaged higher than those frozen in mechanical refrigerators, and those made from unpasteurized dairy products averaged much higher than those from pasteurized products. The bacteriological quality of the home-made ice cream averaged lower than that of commercial ice creams (E. S. R., 82, p. 677).

**The final solubility of d-galactose in water,** S. P. Gould. (U. S. D. A.). (*Jour. Dairy Sci., 23 (1940), No. 3, p. 227*).—Saturated galactose solutions at 25° C. were found to contain an average of 32.09 gm. per 100 gm. of solution, equivalent to a solubility of 47.25 gm. of galactose in 100 gm. of water.

## VETERINARY MEDICINE

**An outline of lectures on pathogenic bacteriology and immunity with relation to the domestic animals,** W. A. Hagan (*Ann Arbor, Mich.: Edwards Bros., 1939, rev., pp. XI+149*).—This outline takes up the subject of pathogenic bacteriology and immunity in two parts. The first part (pp. 1–28) deals with the mechanism of infection and resistance in 14 sections; the second (pp. 29–149) with the micro-organisms pathogenic for animals, grouped in 25 sections.

**The true nature of viruses,** W. M. Crofton (*London: John Bale, Sons & Curnow, 2. ed., pp. XVIII+166, [pls. 42]*).—Following a brief introduction, the several chapters deal, respectively, with (1) the virus phase of the tubercle bacillus, (2) fowl pox and smallpox, (3) distemper and influenza, (4) sarcomata, and (5) scleroses, degenerations, etc. Foot-and-mouth disease, results of experiments carried out in France with Dr. Crofton's vaccine treatment in the departments of Sologne, Beauce, and Seine et Oise, and brief accounts of rabies, vaccinia, distemper, swine fever, influenza, and cancer are considered in an appendix.

**Susceptibility of wild mice to the virus of St. Louis encephalitis,** C. G. Harford, S. E. Sulkin, and J. Bronfenbrenner (*Pests, 8 (1940), No. 3, p. 9*).

**The intradermal inoculation of Brucella abortus as a means of determining the approximate degree of virulence,** F. W. Priestley (*Vet. Rec., 51 (1939), No. 49, pp. 1423, 1424, fig. 1*).—It is shown that there is an approximate

relationship between the virulence of *B. abortus* and its power to produce skin necrosis on intradermal inoculation.

**A new type of Salmonella (S. ballerup) with Vi-antigen,** F. KAUFFMANN and E. MØLLER (*Jour. Hyg.* [*London*], *40* (*1940*), *No. 2, pp. 246–251*).

**The preservation of the infectious agents of some of the rickettsioses,** N. H. TOPPING (*Pub. Health Rpts.* [*U. S.*], *55* (*1940*), *No. 13, pp. 545–547*).—The so-called lyophile or cryochem technic is said to offer an economical and convenient method for the preservation of rickettsial material.

**The pathology and pathogenesis of tuberculosis in domesticated animals compared with man,** J. R. M. INNES (*Vet. Jour.*, *96* (*1940*), *Nos. 2, pp. 42–50, pls. 9; 3, pp. 96–105*).—Following a discussion of the effect of tubercle bacilli on tissues, the disease in the dog and cat is compared with its appearance in man. A three-page list of references to the literature is included.

**Helminth parasites of Australia.—A bibliography with alphabetical lists of authors, hosts, and parasites,** M. R. YOUNG (*St. Albans, Eng.: Imp. Bur. Agr. Parasitol., 1939, pp.* [*2*]+*145*).—This contribution includes a list of helminth parasites of animals systematically arranged according to hosts (pp. 49–84). An alphabetically arranged list of such parasites, including trematodes, cestodes, and nematodes, indicating their hosts and known localities, follows (pp. 85–145).

**Studies on the saline requirements of the larvae of Ascaris suum,** D. W. FENWICK (*Jour. Helminthol.*, *17* (*1939*), *No. 4, pp. 211–228, figs. 5*).

**Anaplasmosis transmission by Dermacentor andersoni Stiles,** L. E. ROZEBOOM, G. W. STILES, and L. H. MOE. (Okla. Expt. Sta. and U. S. D. A.). (*Jour. Parasitol.*, *26* (*1940*), *No. 2, pp. 95–100*).—The authors have been unable to demonstrate hereditary survival of *Anaplasma marginale* in the eggs or larvae of the spotted fever tick *D. andersoni.* "First generation nymphs and adults of *D. andersoni*, progeny of females that had fed on a recently recovered case of anaplasmosis, did not transmit the disease by feeding on susceptible cows. Positive results were obtained in three experiments with male *D. andersoni.* In one experiment there was a 2-hr. interval between the transfer of a single male from the infected animal to the healthy cow; this male apparently transmitted the parasites by a single feeding. In the second positive experiment a single male that had fed on a clinical case was kept in the laboratory for a day before it was placed on a clean cow. In the third experiment four males transmitted the disease to a healthy animal after having been kept in the laboratory for 47 days between the infective and infecting feedings."

**The effect of short electric wave radiation on the development of Trichinella spiralis,** F. J. HOLL, A. J. SIMON, and L. G. HECTOR (*Amer. Jour. Hyg.*, *31* (*1940*), *No. 2, Sect. D, pp. 32–36, fig. 1*).—The experiments reported have shown high frequency radiation to have a marked retarding effect on the development of *T. spiralis.* "The number of larvae killed by the effect of the higher range of the frequencies was 40 percent and those by the lower range 47.64 percent. Since no heat changes were observed, it was concluded that the reduction in the number of trichinae was due to the electromechanical vibrations set up within the living cells or the rearrangement of the molecular structure of the protoplasm of the cell."

**Trichinosis in an American badger (Taxidea taxus taxus),** C. M. HERMAN and L. J. GOSS (*Jour. Parasitol.*, *26* (*1940*), *No. 2, p. 157*).

**Exsheathing and sterilizing infective nematode larvae,** R. W. GLASER and N. R. STOLL (*Jour. Parasitol.*, *26* (*1940*), *No. 2, pp. 87–94, figs. 2*).—The authors find that the second ecdysis of certain nematode larvae can be readily produced by placing them in Labarraque's solution at a dilution of 1 to 20 with water. Nematodes so treated include *Haemonchus contortus*, *Ostertagia circumcincta*, *Trichostrongylus axei*, *Obeliscoides cuniculi*, and *Nippostrongylus muris*.

**Technique for the estimation of pasture infestation by strongyloid larvae,** E. L. Taylor (*Parasitology, 31 (1939), No. 4, pp. 473–478, fig. 1*).—Report is made on the technic to be employed in an investigation of the factors concerned in the development of the strongyloid diseases of grazing animals.

**Poisonous plants: Drawings of poisonous plants found to be injurious to man and farm animals,** A. H. Larson, R. B. Harvey, and L. Erickson. (Minn. Expt. Sta.). (*Seed Trade Buyers Guide, 22 (1939), pp. 105–122, figs. 15*).—Short descriptions and detailed drawings are given of weeds that commonly cause poisoning of livestock.

**Peganum harmala, a poisonous plant in the southwest,** E. A. Moran, J. F. Couch, and A. B. Clawson. (U. S. D. A.). (*Vet. Med., 35 (1940), No. 4, pp. 234, 235*).—Observations and the feeding of an introduced plant identified as *P. harmala*, and known as Syrian rue and African rue, which has lately appeared and become abundant on a certain section of land in New Mexico, have shown it to be definitely poisonous.

**Poisonous plants of India,** R. N. Chopra and R. L. Badhwar (*Indian Jour. Agr. Sci., 10 (1940), No. 1, pp. 1–44*).—An account of the poisonous plants of India, the details of which are given in tables covering 29 pages.

**Pyrethrum as an ascaricide, in vitro studies,** J. W. Landsberg and N. J. Accousti (*Jour. Parasitol., 26 (1940), No. 2, pp. 105–110*).—Studies were made by the in vitro method of Lamson and Brown (E. S. R., 74, p. 850) of various concentrations of the petroleum ether, chloroform, alcohol, and tetrachloroethylene extracts, as well as the crude pyrethrum, to determine their ascaricide properties. "When compared with other anthelmintics, tested by the same procedure, the pyrethrum preparations were found to have no activity. This observation, however, does not eliminate them completely as ascaricides but indicates further studies, adequately controlled, in experimental animals and man."

**Clinical studies of sulfapyridine in small animal practice,** J. R. Ketchersid. (Tex. A. and M. Col.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 758, pp. 661, 662*).—Results obtained in the treatment of 20 cases reported indicate that sulfapyridine is highly effective in septicemic diseases of dogs when given in initial daily doses of 1 gr. per pound of body weight divided into 4 doses. It is recommended that this dosage be decreased 50 percent each succeeding 24 hr. It is considered advisable to continue the use of the drug at least 48 hr. after the temperature reaches normal.

**Studies on black-leg ("manqueira"): Etiology; diagnosis** [trans. title], C. Rodrigues (*Arq. Inst. Biol. [São Paulo], 10 (1939), pp. 1–30; Eng. abs., pp. 27–29*).—Work aimed at identification of the etiological agents of blackleg in São Paulo, Brazil, in which 44 cases of this disease were studied, has led to the conclusion that the affection in that area is caused by *Clostridium chauvei* and that this is probably the only organism responsible for the disease. A list is given of 36 references to the literature.

**A preliminary report on an infectious encephalomyelitis of cattle,** S. H. McNutt. (Iowa State Col.). (*Vet. Med., 35 (1940), No. 4, pp. 228–230*).—Report is made of a new disease closely resembling that due to *Listerella* infection, which has been observed for the past several years in the region of Ames, Iowa. It is said to be primarily an infectious encephalitis and meningitis and observed only in young cattle. Final decision regarding it has to await a more thorough study and a close comparison with all other known forms.

**Existence of tropical variety of cattle-fever tick (=Boöphilus annulatus var. australis) complicates tick eradication in Florida,** J. V. Knapp (*Jour.*

*Amer. Vet. Med. Assoc., 96 (1940), No. 758, pp. 607, 608).*—Reporting upon the tick eradication work in Florida, attention is called to the problem of eradication of the tropical variety *B. annulatus australis* from the deer-tick-infested swamp area in the south central counties.

**A simple medium for the cultural diagnosis of Trichomonas foetus infection in cattle,** J. L. Avery and G. G. Garlick. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc., 7 (1940), No. 1, pp. 27–29*).—Description is given of the preparation of a simple medium for the cultural diagnosis of *T. foetus*. This consists of egg slants covered with a 0.75-percent solution of sodium chloride. A comparison of its efficiency with the Ringer egg-blood serum medium used for the continuous cultivation of *T. foetus* showed it to be more accurate for diagnostic purposes only. The Ringer egg-blood serum medium incubated at room temperature gave more accurate results than when incubated at 37° C. Although satisfactory for use in cultural diagnosis, the saline egg medium is not suitable for the continuous cultivation of *T. foetus*.

**Turning sickness of cattle and Trypanosoma theileri,** J. Carmichael (*Parasitology, 31 (1939), No. 4, pp. 498–500*).

**Lead and coal-tar-pitch poisoning in cattle,** C. H. Case (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 758, pp. 663, 664*).—This brief contribution supplements that by Graham, Hester, and Henderson (E. S. R., 82, p. 822) and reports such poisoning in two cows.

**Sheep diseases,** H. Welch. (Mont. Expt. Sta.). (*Southwest. Sheep and Goat Raiser, 10 (1940), No. 5, pp. 11, 23*).

**The efficacy of crude unconditioned phenothiazine for the removal of gastrointestinal parasites from sheep,** R. T. Habermann, P. D. Harwood, and W. H. Hunt. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc., 7 (1940), No. 1, pp. 16–18*).—In experiments in which six cull sheep were treated with 25 gm. of crude, unconditioned phenothiazine the results indicated that this type of the chemical was as effective for the removal of nematodes from the gastrointestinal tract of sheep as recrystallized phenothiazine. Phenothiazine appears to be less effective in sheep which are obviously ill than in healthy ones.

**Helminth parasites in lambs on a Scottish border farm,** D. O. Morgan and H. H. Corner (*Jour. Helminthol., 17 (1939), No. 4, pp. 203–210*).—Report is made of the number of species of worms recovered from some 20 lambs kept on the same infested field throughout the summer. The percentage of infestation of each by 11 parasite species is recorded.

**Neutralizing antibodies of the virus of Aujeszky's disease in the blood serum of swine in Brazil** [trans. title], V. Carneiro (*Arq. Inst. Biol. [São Paulo], 10 (1939), pp. 305–312; Eng. abs., p. 312*).—The author is led to conclude that hogs in the focuses of bovine infection have been subjected to and recovered from the effects of Aujeszky's virus. This disease exists in Brazil, where it affects hogs and seems to be very frequent in focuses of bovine disease. This is said to be the first demonstration in Brazil of the infection in hogs which included proof of the presence of antibodies in the serum. The chief interest of these researches has been to demonstrate the role of the hog as a virus carrier and source of bovine infection.

**The "O" antigens of S[almonella] cholerae-suis var. kunzendorf strains isolated from pigs in New South Wales,** D. F. Stewart (*Austral. Vet. Jour., 16 (1940), No. 2, p. 88*).

**Etiology of contagious hog pneumonia** [trans. title], P. Bueno (*Arq. Inst. Biol. [São Paulo], 10 (1939), pp. 279–289; Eng. abs., p. 289*).—An account is given of an infectious pneumonia of swine frequently occurring in São Paulo that is caused by the association of a filtrable virus with a bacterium of the genus *Hemophilus*.

**Histological alterations of the lungs produced by the virus of contagious hog pneumonia** [trans. title], P. Bueno (*Arq. Inst. Biol.* [*São Paulo*], *10* (*1939*), *pp. 291–300, pls. 5, fig. 1; Eng. abs., pp. 298, 299*).—A report on the alterations produced by the virus of a pneumonia of swine is presented with a list of 12 references to the literature.

**Studies on an acid-fast bacterium frequently present in tonsillar tissue of swine,** A. G. Karlson and W. H. Feldman (*Jour. Bact.*, *39* (*1940*), *No. 4, pp. 461–472, figs. 2*).—A description is given of an acidfast micro-organism found in 25.5 percent of 94 tonsils removed post mortem from 94 swine, 47 of which animals had at necropsy revealed slight localized lesions of tuberculosis. "The micro-organism apparently produces no recognizable disease in chickens, mice, or calves. Subcutaneous injections of large doses in guinea pigs and rabbits will produce a localized region of caseation necrosis with no tendency toward extension of the lesion. The micro-organism will sensitize guinea pigs to avian tuberculin and to homologous culture filtrates. No sensitivity to mammalian tuberculin is produced. Cross agglutination reactions indicate that the swine tonsil micro-organism has antigenic components in common with the avian tubercle bacillus. We have been unable to find in the literature a description of a similar micro-organism."

**Coccidiosis in a litter of pigs,** L. E. Swanson and K. C. Kates. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, *7* (*1940*), *No. 1, pp. 29, 30*).—Account is given of a litter of nine Poland China pigs about 4.5 mo. of age, found at Moultrie, Ga., to be suffering from coccidiosis. The pigs in which the infection was causing a profuse diarrhea were making poor gains although they had ravenous appetites and were supplied with excellent rations and good care. The largest pig of the litter had a comparatively small oocyst count, while the two smallest pigs had the largest oocyst counts. The feeding of buttermilk as recommended for coccidiosis (minus iodine and potassium iodide) apparently had no beneficial effects.

**Experimental infections of swine with the red stomach worm Hyostrongylus rubidus,** D. A. Porter. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, *7* (*1940*), *No. 1, pp. 20–27, figs. 2*).—Experimental infections were made at Moultrie, Ga., from November 1936 to February 1938 with the red stomach worm *H. rubidus* in swine free from all parasites except *Strongyloides*. "The eggs of the nematode appeared in the feces in from 20 to 25 days after experimental infection. In the case of these animals the maximum number of eggs per gram of feces occurred 23 to 27 days after the administration of larvae, after which the number of eggs decreased until they could be found only by salt flotation during the remainder of the course of infection. The maximum number of worms in relation to the number of larvae fed were recovered from animals examined 24 to 25 days after infection, whereas the number of worms recovered after longer periods of infection were correspondingly smaller. The post-mortem data obtained indicated that both sexes may be about equally long lived. Observations on the course of infection, as adjudged by egg production of this parasite, indicate that infections may persist at least 6 to 8 mo. in the absence of reinfection. At necropsy of the test animals the only lesions noted were in the stomach. The parasites were localized for the most part on the mucosa of the fundus and along the lesser curvature. In this location small ulcers were found. Healed ulcers, appearing as circumscribed craters in the mucosa, were found in cases of pigs necropsied later than 85 days following experimental infection. This indicates that repair of lesions may follow the loss of some of the parasites. Histological examination of stomach tissue showed that the worms may penetrate the mucosa, this pene-

tration producing erosion of the mucosa with attendant inflammatory changes. Clinical evidence of injury to the host by the worms was not observed."

**The diagnosis of virus abortion in mares,** W. W. DIMOCK. (Ky. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 758, pp. 665, 666*).—The author summarizes characteristic features of virus abortion of mares, placing them in 13 categories.

**Improved sequence for rapid consistent purification of equine encephalomyelitis virus protein,** A. R. TAYLOR, D. G. SHARP, H. FINKELSTEIN, and D. and J. W. BEARD (*Soc. Expt. Biol. and Med. Proc., 43 (1940), No. 4, pp. 648–650, fig. 1*).—A description is given of a procedure for purification of equine encephalomyelitis virus protein which yields consistently a product of high molecular homogeneity. It takes advantage chiefly of the following principles: "(1) Prolonged extraction to aid in eliminating the normal chick tissue component; (2) extraction, fractionation, and solution of the protein in a balanced salt solution, mammalian Ringer, instead of 0.9 percent NaCl or buffer salt solutions; (3) filtration of crude extracts with celite to remove mucoid and colloid materials; and (4) aggregation or partial precipitation of the protein in slightly acid medium prior to the first ultracentrifugal cycle."

**Grass sickness in horses,** W. J. GUTHRIE (*Jour. Roy. Agr. Soc. England, 100 (1940), pt. 3, pp. 50–59, figs. 4*).—A summary of information on grass sickness or grass disease, an affection of horses appearing in certain parts of England, Scotland, and Wales, which includes notes on the counties in which it occurs.

**Grass sickness in horses: Biochemical investigation,** J. STEWART, W. S. GORDON, and J. W. MCCALLUM (*Vet. Rec., 52 (1940), No. 13, pp. 237–243, figs. 5*).—A description is given of the clinical, post mortem, and blood pictures of peracute, acute, subacute, and chronic types of grass sickness in horses. It is concluded that the blood picture of the peracute and acute types resembles that of an anhydremia.

**Preliminary observations on the effectiveness of crude, unconditioned *phenothiazine for the removal of worms from horses,*** P. D. HARWOOD, R. T. HABERMANN, E. H. ROBERTS, and W. H. HUNT. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc., 7 (1940), No. 1, pp. 18–20*).—In doses of from 80 to 90 gm. per adult equine, phenothiazine removed 94.5 percent of 53 *Strongylus* spp. and 100 percent of more than 100,000 cylicostomes from 3 horses and a mule.

**Studies of infectious bronchitis,** J. P. DELAPLANE and H. O. STUART (*Rhode Island Sta. Bul. 273 (1939), pp. 15*).—Report is made of studies of infectious bronchitis, a common respiratory disease other than laryngotracheitis and coryza to which chicks of all ages have been found to be susceptible. The work is in continuation of that on respiratory diseases of pullets conducted at the station by Delaplane and his associates (E. S. R., 69, p. 435; 71, p. 854; 75, p. 547; 79, p. 686). It is pointed out that the symptoms of the disease are very similar to laryngotracheitis and it is sometimes difficult to distinguish between the two diseases, and that other respiratory infections, such as infectious coryza, may at times be confused with it. "The mortality in semimature and adult birds has been negligible, but the loss of egg production makes it a disease of economic importance. The disease is readily transmissible by inoculating the larynx, trachea, air sacs, air spaces of bones, and peritoneum with the virus. The virus passes Berkfeld V, N, and W filters and also Mandler preliminary and Seitz filters. Recovery from the disease results in the development of a complete immunity. Birds immune to infectious bronchitis are susceptible to laryngotracheitis and infectious coryza, thus indicating no immunity to these diseases; nor does immunity to these latter diseases protect against infectious bronchitis. Attempts to immunize birds by inoculation of the mucous mem-

brane of the cloaca and the bursa of Fabricius show 'takes,' but immunity does not develop sufficiently soon to prevent infection of the respiratory tract. Formalized virus failed to incite immunity. The virus is neutralized when mixed with serum from immune birds. The observation that a bird which had recovered from the disease except for a mild nasal discharge indicated that such a bird was a 'carrier' of the infection. Bacterial-free strains of the virus may be obtained for egg propagation purposes from the lower trachea. The lesions observed in the embryos of inoculated eggs were characterized by the small size of the embryo."

**Fowl cholera,** L. D. Bushnell. (Kans. Expt. Sta.). (*Vet. Med., 35 (1940), No. 4, pp. 252–255*).

**On the duration of the immunity following the simultaneous injection of Pasteurella avicida and sulfanilamide into chickens** [trans. title], J. Reis (*Arq. Inst. Biol. [São Paulo], 10 (1939), pp. 301–303; Eng. abs., p. 303*).—In the studies reported the author shows that the duration of immunity against fowl cholera resulting from the simultaneous injection of *P. avicida* and sulfanilamide does not reach 6 mo. One of the 28 chickens treated in this way became a healthy carrier of fowl cholera.

**Experiments on cultivation of virus of infectious avian encephalomyelitis,** I. J. Kligler and P. K. Olitsky (*Soc. Expt. Biol. and Med. Proc., 43 (1940), No. 4, pp. 680–683*).—The results relating to epidemiology and to additional properties of the newly discovered virus of infectious avian encephalomyelitis are presented in this study. It is pointed out that embryonic chicks are apparently not susceptible to infection with this avian virus, although birds just hatched are. This is a strikingly reversed state from that which prevails in the case of certain other viruses, which multiply readily in the undifferentiated tissues of the developing embryo but are inactive in the hatched chick. "Whatever the reason may be, a fact of epidemiological significance emerges—the disease agent is probably not transmissible by way of the egg, thus supporting the prior finding of Jones [E. S. R., 71, p. 702]. The virus multiplied in minced whole-embryo tissue-cultures in vitro only under certain indicated conditions. The method in its present state, however, is not favorable for obtaining large yields of highly potent virus for use in immunizing procedures. No multiplication of virus was noted in this medium when chick-embryo brain was used instead of whole-embryo tissue."

**Pathology of rickets in the fowl,** L. P. Doyle. (Purdue Univ.). (*Vet. Med., 35 (1940), No. 4, pp. 248–250, figs. 4*).

**Some parasites of Gallus gallus (L.) observed in the State of S. Paulo** [trans. title], J. Reis (*Arq. Inst. Biol. [São Paulo], 10 (1939), pp. 147–152, pl. 1, figs. 2; Eng. abs., p. 151*).—The occurrence of four parasites of the domestic fowl in the State of São Paulo, Brazil, namely, *Rivoltasia bifurcata*, the chicken mite, *Megninia columbae*, and *Laminosioptes cysticola*, is reported upon. A list is given of 16 references to the literature.

**Redescription and new hosts of Capillaria perforans Kotlán and Orosz 1931: Pathogenic nematodes for domestic fowls** [trans. title], Z. Vaz (*Arq. Inst. Biol. [São Paulo], 10 (1939), pp. 87–92, pl. 1, figs. 12; Eng. abs., p. 92*).—A study of the nematode *C. perforans*, which was the source of an outbreak of capillariasis in a flock of guinea fowls in the State of São Paulo, Brazil, is reported upon. The morphological study has led to the differentiation of this species from *C. contorta*, with which it had been considered by some authors to be identified. In addition to the guinea fowl and the turkey, the pheasant (*Phasianus colchicus*) and the Abyssinian fowl (*Numida ptylorhyncha*) have also been found to harbor this parasite.

**On Postharmostomum commutatum (Diesing 1858)** [trans. title], C. PEREIRA and R. CUOCOLO (*Arq. Inst. Biol. [São Paulo], 10 (1939), pp. 73–86, pls. 2, figs. 4; Eng. abs., pp. 84, 85*).—A detailed account is given of the morphology of a trematode found in the intestine of domestic fowl and its relation to other species of the genus. This trematode has been identified as *P. commutatum*. A list of 35 references to the literature is included.

**The life cycle of Postharmostomum gallinum, the cecal fluke of poultry,** J. E. ALICATA. (Hawaii Expt. Sta.). (*Jour. Parasitol., 26 (1940), No. 2, pp. 135–143, figs. 15*).—The complete life cycle of *P. gallinum* in the intermediate and final hosts has been ascertained. This parasite is known to occur in chickens in Hawaii, being especially common in birds raised on the ground in areas where land snails (*Eulota similaris* and *Subulina octoma*) occur. "Eggs of these parasites when oviposited contain fully developed miracidia. When ingested by *E. similaris*, the eggs hatch and each miracidium may eventually develop in the liver into a branched sporocyst. About 60 days following the original infection, apparently mature cercariae have been found within the sporocyst. Mature cercariae leave the sporocyst and body of the snail host and may reenter the same snail host and reach the pericardial cavity or may infect other snails with which they come in contact of the same or another species. In order to reach the pericardial cavity, it is believed that the cercariae enter the renal aperture which opens at the base of the pallial cavity; from this aperture the cercariae enter the kidney cavity and finally, presumably by crawling into the renal-pericardial aperture, reach the pericardial cavity where they may develop to the adolescarial stage in about 25 days. *S. octona* harbors adolescariae of *P. gallinum*, but this species did not become infected experimentally by feeding them eggs of the fluke. Chicks 6 to 8 weeks old become infected with *P. gallinum* when fed adolescariae from experimentally and naturally infected snails (*E. similaris*) and naturally infected *S. octona*. These flukes develop to maturity in slightly less than a month."

**Three new intermediary vectors for Syngamus trachea,** P. A. CLAPHAM (*Jour. Helminthol., 17 (1939), No. 4, pp. 191, 192*).—Recent observations are said to have shown that the centipede *Scolopendra* sp., the leatherjacket *Tipula* sp., and the springtail *Sminthurus viridis* may all act as vectors of the gapeworm.

**On a sex difference in the infection rate of birds with Syngamus trachea,** P. A. CLAPHAM (*Jour. Helminthol., 17 (1939), No. 4, pp. 192–194*).

**Host-parasite catalogue of the helminths of ducks,** W. C. GOWER (*Amer. Midland Nat., 22 (1939), No. 3, pp. 580–628*).—Part 1 (pp. 581–616) of this catalog consists of a systematically arranged list of parasites, their host, distribution, and a key reference to the literature. Part 2 (pp. 616–622) presents the helminths of ducks listed according to host. A list of 140 references to the literature referred to is included.

**Investigations into the control of blackhead in turkeys,** K. D. DOWNHAM (*Vet. Rec., 52 (1940), No. 7, pp. 120–122*).

**Paratyphoid of pigeons.—I, Serological, bacteriological, and hematological studies of spontaneously infected birds,** H. C. GAUGER, R. E. GREAVES, and F. W. COOK (*North Carolina Sta. Tech. Bul. 62 (1940), pp. 71*).—Studies commenced in August 1936, when an epizootic occurred in a loft of some 500 birds, are reported, the details being given in 13 tables. The results of serological, bacteriological, and hematological studies have led to the following significant findings: *Salmonella typhimurium binns* was the etiological agent. "Live autogenous antigens were superior to autogenous phenolized and alco-

holized antigens and to a formalinized-H antigen in the detection of agglutinins. The organism was recovered from birds repeatedly negative to tube-agglutination tests in which both live and phenolized antigens were employed. The organism was not always recovered from birds that were consistently positive to the tube-agglutination test. Squabs infected at an early age were not proficient in producing an antibody response to the infection which could be detected by the tube-agglutination tests used. Rapid whole-blood agglutination tests did not detect low titer birds. In birds that were in the convalescent or chronic carrier stage of the disease the organism was localized chiefly in the lungs. The organism was recovered from the feces, mouth fluid, and blood of squabs suffering from acute and subacute infection and from the feces and mouth fluids of apparently healthy mature birds that were serologically positive. The organism was recovered from two eggs laid by a serologically positive laboratory mated bird and at autopsy the pathogen was recovered from a blighted ovum in this bird. All of the cultures recovered gave identical reactions in the peptone-salt medium of Bitter, Weigmann, and Habs. Hatchability and livability records in the infected loft were satisfactory during a period in which 37 percent of the breeding birds were positive to the tube-agglutination tests. In mated birds the number of serologically positive females was considerably larger than the number of positive males. Chronic carriers could not be distinguished from noninfected pigeons by hematological studies."

The bibliography presented includes 46 references to the literature.

## AGRICULTURAL ENGINEERING

**Geology and ground-water resources of the Harney Basin, Oregon,** A. M. Piper, T. W. Robinson, and C. F. Park, Jr. (Coop. Oregon Expt. Sta.). (*U. S. Geol. Survey, Water-Supply Paper 841* (*1939*), *pp. VI+189, pls. 20, figs. 9*).—The authors discuss in detail the geological structures included within an area of about 5,300 sq. miles in the semiarid, rather high plateau forming parts of Harney and Grant Counties, in southeastern Oregon, with reference especially to the storage, conduction, yield, and the rates and sources of recharge of the waters found in these formations. Chemical analyses and statements as to the fitness for use in irrigation of waters available in various parts of the Harney Basin are included in the report.

A brief paper on precipitation and tree growth in the Harney Basin, by L. T. Jessup, is also included.

**Surface water supply of the United States, 1938.—Part 12, Pacific slope basins in Washington and upper Columbia River Basin** (*U. S. Geol. Survey, Water-Supply Paper 862* (*1940*), *pp. V+177, pl. 1*).—This records measurements of stream flow in these basins during the year ended September 30, 1938.

**The floods of December 1937 in northern California,** H. D. McGlashan and R. C. Briggs (*U. S. Geol. Survey, Water-Supply Paper 843* (*1939*), *pp. VIII+497, pls. 13, figs. 74*).—This paper presents, for the period that included the floods, records of stage and discharge at about 170 river-measurement stations and records of storage in all the larger reservoirs, together with a summary of peak discharges with comparative data for other floods at 74 measurement points and tables and graphs showing crest stages along the Sacramento and San Joaquin Rivers. There was noted an absence of high water along the lower reaches of the San Joaquin River, in contrast to the flood areas along the lower Sacramento River. Large volumes of floodwaters were withheld by the many storage reservoirs on tributaries of the San Joaquin River, whereas much smaller volumes were detained by the comparatively few storage reservoirs in the Sacramento River Basin.

**Some observations on the behavior of models of gully control structures,** H. B. Roe. (Minn. Expt. Sta.). (*Agr. Engin., 19 (1938), No. 8, pp. 359–362, 364, figs. 8*).—This paper deals with a hydraulic laboratory study, carried out by means of a model, of action of water from heavy run-off on or around the aprons at the foot of dams used in gully control, to determine essential design factors. Gully-floor gradients must be reduced to a stable condition, apron gradients should be steeper than those of the gully floor with a 3-ft. cut-off wall at the apron toe, and submergence of apron toe below gully floor is desirable. A table of recommended lengths of aprons for differing conditions is presented. A cross wall 1 ft. high, across the apron floor, from 3 to 5 ft. from foot of dam, is indicated as essential. Side walls of the dam should be turned at right angles to line of flow and run well into side banks of gully, and heavy riprap, flush with the toe of the apron, and extending from 6 to 8 ft. beyond, is essential in heavy flow.

**List of publications on mechanical properties and structural uses of wood and wood products, October 1939.** (Coop. Univ. Wis.). (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1939, pp. [1]+27*).—This list includes publications that give general information and the results of research on the strength of timber and factors affecting strength, and the design of wooden articles or parts where strength or resistance to external forces is of importance. The material is distributed in the following classifications: Factors affecting strength, joints and fastenings (nails, screws, bolts, modern metal connectors, etc.), methods of determining properties, properties (strength, shrinkage, and weight), species (publications devoted to individual species), steam bending, structural timbers, uses (in airplanes, automobiles and other vehicles, boxes and crates, buildings, cross arms, mine timbers, poles and piling, and ties), and veneer and plywood.

**Homemade rubber tired carts and trailers,** H. H. DeLong (*South Dakota Sta. Bul. 333 (1940), pp. 31, figs. 21*).—Discarded car wheels, axles, frames, and second-hand tires and tubes were used with good results. Draft tests, including measurements of starting force and pull at various points during a run of 107 sec. with an average acceleration of about 0.05 ft. per second, indicated that the pneumatic tire rolls more easily than a steel wheel on all but a very smooth, hard surface; that the large diameter wheel is superior to the small diameter wheel in both the steel wheel and in the pneumatic tired wheel; that a high inflation pressure gives the least rolling resistance with pneumatic tires on hard, smooth tracks; but that a low inflation pressure gives the least rolling resistance with pneumatic tires on soft or rough tracks.

The tires with the larger cross sections have proven more adaptable to farm cart uses than the small cross-section tire, although the large cross-section tire adds greatly to the width of farm carts or seriously reduces cart capacity.

It is further noted that the 6–16 tire is by far the most popular size today, with the result that second-hand casings and tubes in this size tire can be obtained easily and cheaply. The old steel disk automobile wheel can be cut down by a welder and a 6–16 drop-center rim welded on to make a trailer wheel which will use the popular sized tire. The bicycle wheel is desirable only for very light carts which are to carry loads of 150 lb. or less per wheel. A trailer for moving brooder houses and farrowing houses can be made of old car parts. Such a trailer lightens the work, saves yards and lanes, and prevents serious twisting of framework which the buildings receive when dragged on skids. The low platform trailer can be equipped with water tank and sack rack for hauling feed and water to hogs on pasture and has numerous uses about the farm.

**Lespedeza seed-harvesting equipment,** H. A. Arnold (*Tennessee Sta. Bul. 171 (1940), pp. 20, figs. 7*).—Studies of seed-pan attachments on mowers, both

of home-made and of commercially available types, as compared with threshing, combining from the windrow, or direct combining, indicated, in general, that the use of a lespedeza seed-harvesting attachment would be profitable where seed is not harvested by the direct combine method.

All harvesters of the pan type were found to be comparatively low in first cost. They harvest only fully ripened seed. Unlike threshers and combines, they left dodder seed unhulled, so that it was more easily cleaned out of lespedeza seed, especially Korean. Threshing or combining lespedeza from the windrow usually resulted in considerable windrow losses. Seed-harvesting attachment units on mowers greatly reduced these losses. Direct combining eliminated the windrow losses. In the harvesting of short lespedeza or lespedeza on rough land, cutting with a mower resulted, under ordinary conditions, in comparatively low stubble losses, even when direct combining was practiced.

The harvesting-attachment units collected only the seed that shattered readily from the straw. In the harvesting of Korean lespedeza, early in November, from 40 to 60 percent of the seed passing over the cutter bar was collected by the attachments. In the case of Kobe, about two-thirds of the seed was collected and about one-third was lost with the straw (straw and separating losses). The amount of loose seed lost with the straw through poor separation was small in the case of Korean, but was about 16 percent in the case of Kobe because of the small perforations used on the commercial attachment units. In field tests of two commercial machines of the rake and of the slat-conveyor types, the latter was slightly more efficient in thin to medium stands of lespedeza, the former in thick, rank growths. Seed lost ahead of the mower cutter bar varied from 60 to 166 lb. per acre, or from 13 to 32 percent of the seed on the stalk. A sharpened sickle reduced the cutter bar losses by two-thirds.

**Milk tank sizes and power requirements**, H. W. Riley. (Cornell Univ.). (*Jour. Milk Technol., 2 (1939), No. 6, pp. 295–299*).—Data are presented on the power requirements for cooling milk in 10-gal. cans, submerged in water, when the cooling is produced by electrically operated refrigerating machines. Agitation of the cooling medium was found essential to rapid cooling. It is recommended that at least $\frac{1}{12}$ hp. per can be provided for cooling once in 24 hr., and at least $\frac{1}{8}$ hp. per can for cooling twice in 24 hr.

## AGRICULTURAL ECONOMICS

**[Proceedings of the thirtieth annual meeting of the American Farm Economic Association]** (*Jour. Farm Econ., 22 (1940), No. 1, pp. 1–389, figs. 7*).—Included are the following papers, with discussions, presented at the meeting held at Philadelphia, Pa., December 27–29, 1939: Place of Farmers, Economists, and Administrators in Developing Agricultural Policy, by C. C. Davis (pp. 1–9); Problem of Poverty in Agriculture, by M. L. Wilson (pp. 10–33), and Needed Points of Development and Reorientation in Land Economic Theory, by L. C. Gray and M. Regan (pp. 34–51) (both U. S. D. A.); Nature and Scope of Training for Men Contemplating Work in the Field of Agricultural Economics, by C. L. Alsberg (pp. 52–59) (Univ. Calif.); Needed Additions to the Theoretical Equipment of an Agricultural Economist, by T. W. Schultz (pp. 60–66) (Iowa State Col.); New Developments in Personnel Selection, Training, and Advancement in the Federal Service, by R. F. Hendrickson (pp. 67–77) (U. S. D. A.); Personnel Training and Recruitment in Agricultural Economics, by W. E. Grimes (pp. 78–83) (Kans. State Col.); Early History of Agricultural Economics, by H. C. Taylor (pp. 84–97); Agriculture in the United States, 1839 and 1939, by A. G. Peterson (pp. 98–137) (U. S. D. A.); How Should Agriculture Be Financed?

by W. G. Murray (pp. 138–147) (Iowa State Col.); Use of the Normal Value Concept as a Stabilizing Influence in Agriculture, by E. C. Young (pp. 148–161) (Purdue Univ.); Changing Organization of Agricultural Markets, by A. C. Hoffman (pp. 162–172) (U. S. D. A.); Economic Significance of Changes in Market Organization, by H. B. Rowe (pp. 173–187); Cotton, Land, and People—A Statement of the Problem, by I. W. Duggan (pp. 188–197) (U. S. D. A.); How Can the Southern Population Find Gainful Employment? by R. B. Vance (pp. 198–205) (Univ. N. C.); What Changes in National Policy Does the South Need? by C. B. Hoover (pp. 206–214); Allocation of Milk Supplies Among Contiguous Markets, by D. O. Hammerberg (pp. 215–219) (Univ. Conn.); Transportation and Country Assembly of Milk, by R. G. Bressler, Jr. (pp. 220–224); Market-Sharing in the Packing Industry, by W. H. Nicholls (pp. 225–240) (Iowa Expt. Sta.); State Laws Which Limit Competition in Agricultural Products, by G. R. Taylor (pp. 241–248); Determining Input-Output Relationships in Milk Production, by E. Jensen (pp. 249–258), Supervised Farming, by E. A. Starch (pp. 259–263), and Unit Reorganization Program for the Southern Great Plains, by R. I. Kimmel (pp. 264–269) (all U. S. D. A.); When and Under What Conditions Should a Mortgage on a Farm Be Foreclosed? by L. J. Norton (pp. 270–276) (Univ. Ill.); How Can Delinquent Loans and Foreclosed Properties Best Be Serviced and Handled? by J. M. Huston (pp. 277–284); What Elements Enter Into a Desirable Resale Policy? by E. C. Johnson (pp. 285–291); County Planning Project—A Cooperative Approach to Agricultural Planning, by B. W. Allin (pp. 292–316), Agricultural Surpluses and Nutritional Deficits—A Statement of the Problem and Some Factors Affecting Its Solution, by O. V. Wells (pp. 317–323), and Programs for Using Agricultural Surpluses to Reduce Malnutrition and To Benefit Farmers, by F. V. Waugh (pp. 324–340) (all U. S. D. A.); New Developments in Agricultural Sampling, by A. J. King and G. D. Simpson (pp. 341–349) (U. S. D. A. and Iowa State Col.); Agricultural Census of 1940, by W. B. Jenkins (pp. 350–358); Characteristics of U. S. Poultry Statistics, by E. S. Kimball (pp. 359–368) (U. S. D. A.); and War Adjustments for American Agriculture, by A. Hobson (pp. 369–378) (Univ. Wis.).

The reports of the officers and committees are also included.

**[Investigations in agricultural economics by the Maine Station, 1938–39]** (*Maine Sta. Bul. 397 (1939), pp. 718–721, 782, 784, 785*).—In addition to results previously noted, some brief findings are included as follows: (1) By G. F. Dow, as to the proportion of milk sold by producer-distributors in the smaller and larger markets, average daily sales of distributors, effect of increase of 1 ct. per quart in the price of milk on consumption, seasonal variation in sales of milk and cream, percentage of surplus milk, etc.; (2) by C. H. Merchant on farm credit conditions in Aroostook County; (3) by Merchant and A. E. Watson, as to use of land, mileage of roads of different types, electric and telephone facilities on farms, and tax revenues in 11 towns in the southern and south central part of Aroostook County; and (4) by W. E. Schrumpf, as to the average capital investment, gross farm receipts, farm expenses, farm income, and cost of growing, harvesting, storing, and selling potatoes for the crop year 1937 on 241 representative farms in the St. John River area of Aroostook County.

**Current Farm Economics, [February–April 1940]** (*Oklahoma Sta., Cur. Farm Econ., 13 (1940), No. 1–2, pp. 48, figs. 13*).—The usual tables of indexes of prices, demand deposits, and purchasing power of Oklahoma farm products are brought down to March 1940. Articles are included on The Agricultural Situation, by M. Hill (pp. 2–4); What is Balanced Farming? by P. Nelson (pp. 4–12); Oklahoma Cash Farm Income, 1936–1939, by M. Hill (pp. 12–14); Some

Facts Concerning the Ownership of Land in Oklahoma, by R. T. Klemme (pp. 15–21); Listed Causes of Failure of Oklahoma Farm Cooperatives, by A. L. Larson (pp. 22–24); Oklahoma Farm Population Changes in 1938, by O. D. Duncan (pp. 24–33); and An Analysis of Some Terms Pertaining to Reciprocal Trade Agreements, by R. T. Klemme (pp. 34–36); and a discussion, by Hill (pp. 37–41) of the significance of the revised price and other statistics included in Bulletin 238 (E. S. R., 82, p. 837). The revised indexes are brought down to date.

**Some legal aspects of landlord-tenant relationships in Ohio,** H. R. Moore (*Ohio State Univ., Dept. Rural Econ. Mimeog. Bul. 119 (1939), pp. [2]+25*).—The different types of interest in land are described briefly. The formalities for creating and terminating leases, security for payment of rent, the doctrines of emblements, waste, and fixtures, and the differences between lessor-lessee, master-servant, principal-agent, and partnership relations are discussed.

**Specific legislation affecting farm tenure which should be encouraged,** C. H. Hamilton. (U. S. D. A.). (*Southwest. Social Sci. Quart., 20 (1940), No. 4, pp. 397–406*).—The author discusses legislation pertaining to farm tenure in Texas.

**[Relationship of farm income and production efficiency],** W. P. Thomas (*Farm and Home Sci. [Utah Sta.], 1 (1940), No. 1, pp. 1, 6*).—A table is included and discussed showing the relation of crop yields and labor earnings in Sanpete, Sevier, and Utah Counties. Brief statements are made as to the effect of egg production on net profit per hen on Utah poultry farms, and the effect of lamb crop on labor income on sheep ranges in the Uinta Basin.

**Adjusting farm management to changing economic situations,** J. L. Tennant. (Coop. U. S. D. A.). (*Rhode Island Sta. Bul. 274 (1939), pp. 35, figs. 8*).—This study was made to develop information for use in adjusting the organization and management of farm business to the changing economic conditions. It discusses the size and types of farms; trends of crop yields, farm wages, and prices of feed and fertilizers; and the management problems of dairy and poultry farms. The analysis of the organization and management of dairy farms is based on records from 22 farms in 1932 and 21 farms in 1934, on which there were 5 cows or more and 50 percent or more of the total cash receipts were from the dairy enterprise. The analysis for the poultry farms is based on records from 40 farms having 200 or more hens. The records were obtained in the spring of 1935 for the preceding year's business.

**Estimated gross cash income from the sale of agricultural products from the farm, and from Agricultural Adjustment Administration payments for Ohio farms, by counties, 1938,** P. P. Wallrabenstein and J. I. Falconer (*Ohio State Univ., Dept. Rural Econ. Mimeog. Bul. 121 (1939), pp. [1]+11*).—This bulletin continues the series (E. S. R., 81, p. 444). Tables are included showing the number of counties in which different enterprises rank first to sixth as to sources of income; and by counties the estimated gross cash income from sales and A. A. A. payments, the average total income per farm and per acre, and the percentage of gross cash income derived from each of the six most important enterprises.

**Tobacco production and consumption in the Netherlands Indies,** J. B. Gibbs (*U. S. Dept. Agr., Off. Foreign Agr. Relat., F. S. 81 (1940), pp. IV+70, figs. 11*).—The several sections of the report describe and discuss tobacco production—quantity produced and trend, types of tobacco, the nine producing districts, their soil, climate, tobacco grown, and cultural and curing practices—grading and marketing of different types of tobacco, imports and exports of leaf tobacco and tobacco products, the manufacture and consumption of tobacco products, and possible developments affecting American tobacco farmers.

**An economic study of the maple products industry in Garrett County, Maryland**, R. E. HUFFMAN, S. H. DEVAULT, and J. W. CODDINGTON (*Maryland Sta. Bul. 431 (1940), pp. 165–215, figs. 19*).—Data were obtained in 1938 and 1939 regarding 130 sugar groves, of which in 1938, 110 were operated and produced sirup or sugar for the market, 18 were not operated, and 2 produced only a few gallons of sirup. The development of the maple products industry, the physical conditions desirable for the industry and those prevailing in the county, and the location and extent of the industry in the county are described. Methods of starting and bringing groves into production; the amount, value, and quality of maple products in the county; the factors affecting yields; management practices; costs of production and marketing of sirup in the county; methods of marketing; returns; the factors affecting profits; and the future of the industry in relation to land use are analyzed and discussed and recommendations made.

In 1938 the sugar groves in the county yielded 27,557 gal. of sirup and 7,285 lb. of sugar. Sixty-two percent of the products graded fancy or prime. The average cost of production per gallon of sirup was 88 ct. and the marketing cost 1 ct. The average cost decreased as the size of grove increased. The average price received for sirup was $1.31 per gallon and for sugar 17 ct. per pound. The average earning per hour of operator's labor was 58 ct., the average net profit per grove $109.77, and the average return on capital 11 percent.

**Financial operations of Ohio farmer owned elevators during the fiscal year 1938–39**, B. A. WALLACE (*Ohio State Univ., Dept. Rural Econ. Mimeog. Bul. 122 (1939), pp. [1]+20*).—This bulletin, which continues the series (E. S. R., 81, p. 443), is based on the main balance sheet and income and expense items from 147 companies operating 189 plants, detailed analysis of expense items from 43 companies, commodity sales and margins from 50 companies, and accounts receivable data from 19 companies.

**Cooperative marketing of forest products.—A bibliography** (*U. S. Dept. Agr., Forest Serv., 1939, pp. III+22*).—This bibliography was prepared to aid foresters interested in forming cooperative associations for the management of forest lands and marketing of forest products, farm woodland owners, and others engaged in furthering agricultural and forestry programs among farmers. A reading list (pp. 16–22) on agricultural cooperatives stressing organization, financial set-up, and management is included.

**Yearbook of agricultural co-operation, 1940**, edited by THE HORACE PLUNKETT FOUNDATION (*London: P. S. King & Son, 1940, pp. VI+361*).—Included are articles on Agricultural Co-operation in 1939 (pp. 1–4); The International Labour Office and the Co-operative Movement, by M. Colombian (pp. 5–9); Agricultural Co-operation in the Eastern United States of America, by M. Digby (pp. 10–102); Ten Years of Co-operative Purchasing in England, by D. R. Wilson (pp. 103–155); and by different authors on cooperation in various countries. The legislation during the year in different countries is briefly summarized. A number of books, surveys, and reports are reviewed.

## RURAL SOCIOLOGY

**Rural population density in the southern Appalachians**, F. J. MARSCHNER (*U. S. Dept. Agr., Misc. Pub. 367 (1940), pp. 18, fig. 1, map 1*).—Following general observations, the population density in the central, eastern, and western divisions of the area, and the southern Appalachian fringe, as well as the intensive settlement at the base of the mountains, are discussed. A color map of the area is included.

"Distribution of population density in the southern Appalachians is, in its extreme occurrences of concentration and sparsity, largely controlled by and related to the physiographic character of the region and the location of its mineral resources. For the intermediate densities, in areas in which the population is primarily dependent on land use, especially farming, a similar simple and direct relationship is much less in evidence. There are areas which may be considered as conforming to the premises that the greater adaptability of the land to farming is responsible for the denser population, or conversely, that because the land is poorly adapted to farming the population is sparse. But the exceptions are too many to establish such a relationship as the prevailing rule. Economic factors and technical development frequently exert a stronger influence on intensity of land use and on population density than does the quality of the land itself. Basic sources of information are as yet too incomplete and meager to permit more than a tentative inference as to reasons why certain areas are populated as they are. Moreover, population density is in a state of constant flux. Migration is stronger and birth rates are higher in some sections than in others."

**Standards of living in six Virginia counties,** D. M. DAVIDSON, JR., and B. L. HUMMEL. (Coop. Va. A. and M. Col. et al.). (*U. S. Dept. Agr., Farm Security Admin. and Bur. Agr. Econ., Social Res. Rpt., 15 (1940), pp. [4]+116, figs. 7*).—This study, the last of a series of 6 reports on levels of living (E. S. R., 80, pp. 413, 841, 842), was conducted in 6 counties of Virginia in an effort to supplement existing knowledge of the levels of living and consumption behavior of various segments of the population. The principal index used was the total value of goods and services consumed for family living purposes. Forty-six percent of the 1,730 farm families and 44 percent of the 761 urban families included in the study reported a total value of living for 1935 that was less than $1,000. The average value of all goods used by the farm families for family living was $1,130, 44 percent of which was furnished. For the town families this value was $1,332, 14 percent of which was furnished. As measured by the value-of-living index, differences between the tenure groups were large. The farm owners reported an average of $1,249, the renters $946, and the croppers $719. Urban families who owned their dwellings reported an average value of family living of $1,558, while those residing in rented dwellings reported $1,153. Families in the tobacco counties, Halifax and Prince Edward, and the southwestern county, Wythe, reported an average value of housing and maintenance that was low in comparison with that of other counties. There was a definite relationship between the duration of marriage and the total value of goods and services consumed. The average amount of savings and investments for the farm families was $102; in the towns it was $168. The owners reported an average of $118, the renters $79, and the croppers $36. During 1935 the farm families reported that they read an average of 6.8 State bulletins and 5.3 Federal bulletins.

**A rural school area in central South Carolina,** H. L. FULMER (*South Carolina Sta. Bul. 325 (1940), pp. 44, figs. 29*).—Continuing this series of studies (E. S. R., 81, p. 860) in an area comprising 15 rural school districts in Lexington County, it was found that 56 percent of the owner families and 82 percent of the tenant families were found to spend less than $50 per year for clothes. Sixty-nine percent of the owner families and 47 percent of the tenant families spend less than $50 per year for food. Cotton, fruits, vegetables, and chickens are the farm items from which almost all of the cash is derived. The average annual cash income does not exceed $350 per family. A very high percentage of the elementary pupils, especially those from under-privileged homes, fails to complete elementary school. One-half of all high school pupils from tenant homes were enrolled in the eighth grade. The ratio of high school to elementary pupils is 1:11 among pupils

from tenant homes but 1:2.2 among pupils from owner homes. A much higher percentage of owner than of tenant youth (5:1) had left the area in search of employment.

The elementary school teacher of the area, as a rule, is a product of the community, elected by the local school trustees. Two of the 27 teachers had not attended as much as 1 yr. in college, while 3 attended only 1 yr. "Most of the elementary teachers have traveled but little beyond the borders of the State. The elementary schools are top-heavy with lay management and are in need of educational leadership. The trustees, who outnumber the teachers two to one, influence to a very great extent the teaching program of the schools. These rural elementary pupils are not receiving the benefits of library service, recreational services, health education, or the proper instruction in food and diet problems. . . . With the present plan of disbursing State aid for current school cost, these small districts are not encouraged to consolidate into a larger unit. There should not be placed a financial penalty on the small district when it endeavors to provide better school facilities for its children."

***The Lansing region and its tributary town-country communities***, J. F. THADEN (*Michigan Sta. Spec. Bul. 302 (1940), pp. 50, figs. 15*).—This study involved a mapping of the areas served by the banking centers, the hardware centers, the newspaper centers, the post office centers, the high school centers, the grocery centers, and so on, in 88 townships of 5.5 counties tributary to Lansing, and an analysis of the variation in agriculture and population characteristics with increasing distance from Lansing, using concentric zones of townships as units. In 1928, 20 hamlets and villages with fewer than 500 inhabitants had a bank, now only 6 of these places have a bank. Only 24 of the 59 population centers offer hardware, high school, R. F. D., banking, newspaper, and clothing service. Township lines very frequently cut across areas where people with common interests reside. The people in a few townships live in as many as 5 different communities. In only 15 of the 88 townships do all of the people live in the same given community. Four-fifths of the communities have more people in the tributary service area than within the corporate boundaries of the village. Excluding the population living within community centers, 80 of the 88 townships had fewer people in 1930 than in 1880. The 8 that increased adjoin the larger urban centers.

**Peasant villages in the west of the United States** [trans. title], L. NELSON (*Internatl. Agrar-Rundschau, No. 1 (1939), pp. 38–43, Fr., Ital., Eng. abs., pp. 42, 43; abs. in Minnesota Sta. Rpt. 1939, pp. 49, 50*).—In the territory of the Rocky Mountains about 300,000 Mormons of English origin live together in villages. The cause of this form of dwelling is probably closely connected with the religious ideology of the settlers, who erected "towns of Zion" all over the West and form the basis of the present form of settlement. Sometimes the communities are hamlets only, whereas elsewhere they reach the size of a small town, though with no more than 5,000 inhabitants. "The assumption that the extension of the roads and the development of the motor car will lead to a trend from the Mormon towns seems doubtful, particularly as the dwelling together—apart from the disadvantage of the long way from the house to the field—offers advantages in connection with civilization which—based on the strength of the social tradition of the Mormon community—make a continuation of these village settlements highly probable."

**The farm laborer**, L. NELSON. (Minn. Expt. Sta.). (*Amer. Country Life Conf. Proc., 21 (1938), pp. 96–107*).—The author concludes that "farm laborers in the rural population constitute our least privileged group. Even though they number over 3 million, they are inarticulate as a class, having no regular organi-

zation through which their needs and wants are made known. They are poorly housed and poorly paid. Indeed it is doubtful if there is another occupational group in the country which has such a low standard of living. They have a high birth rate, and the migratory character of many of them makes it difficult for them to have educational advantages, health care, and opportunities for a normal community life. Social legislation designed for industrial labor specifically exempts agricultural labor from its benefits.

"Various proposals which have been put forward to benefit farm labor include the following: (1) A moratorium on the introduction of labor-saving machinery into agriculture; (2) encouraging greater efficiency in agricultural enterprises, through enlargement and technical improvements, so as to enable the entrepreneur to pay better wages and achieve higher standards for labor; (3) settlement of workers on small holdings to engage in self-sufficient farming; (4) overhauling and reorganization of urban industries and the acceleration of industrial production so that more laborers could be absorbed from the rural areas and greater demand for agricultural products be created; [and] (5) a works program for rural areas to be continued indefinitely to care for the derelicts."

**Dependent children in South Dakota,** R. L. WOOLBERT and R. L. MCNAMARA (*South Dakota Sta. Bul. 332 (1940), pp. 40, figs. 3*).—Cooperating with the State Works Progress Administration and other agencies, the authors report upon relief for dependent children, their households, costs, and the consequences of a State-Federal program. A State-wide survey showed that between July 1, 1937, and June 30, 1938, 13,098 children residing in 5,772 households containing a total of 25,654 persons were dependent according to definition. Out of $1,668,077 available as public relief in these households, $1,015,717 was Federal, $613,576 was county, and $38,784 was State money.

**The composition of the population of Louisiana State penitentiary, 1859, 1860, and 1861,** T. L. SMITH and H. L. HITT. (La. State Univ.). (*Southwest. Social Sci. Quart., 20 (1940), No. 4, pp. 361–374, figs. 8*).—For the years listed the female was subjected to penal confinement less frequently than the male and the white female less frequently than the Negress of that period. Of the 624 males in prison at the time, 490 were white and 132 were Negroes. The foreign-born ante bellum population had a much higher criminality rate than the native-born population. It is concluded that the factors studied associated with criminality are valid as causes only insofar as they are indicative of the basic social and cultural phenomena at the roots of human behavior.

**What rural culture means,** C. L. CHRISTENSEN. (Univ. Wis.). (*Rural Amer., 18 (1940), No. 4, pp. 9, 10*).—The author discusses folk schools as a means of enriching the lives of rural people and gives examples.

## FOODS—HUMAN NUTRITION

**[Foods and nutrition studies by the Maine Station]** (*Maine Sta. Bul. 397 (1939), pp. 722–773, figs. 10*).—These progress reports (E. S. R., 81, p. 140) summarize a continuation by M. M. Clayton of the study of the food habits and nutritional status of children in selected communities in Maine (pp. 722–726), and further discussion by W. F. Dove of the relation of man and animals to the environment under the topics a research program based upon the principle of production for use, the contiguity to superior foods as related to the geographic incidence of malnutrition, specialization-diversification patterns of needs and of production to meet the needs, the evaluation of foods in terms of the nutritional needs of superior individuals of the aggridant type, some bio-ecological and bio-economic applications of food production for use, and (by E. F.

Murphy and Dove) of the selection of genetic strains of fruits and vegetables high in mineral and vitamin content (pp. 726–773).

**Deep fat frying at high altitudes,** E. J. THIESSEN (*Wyoming Sta. Bul. 235 (1940), pp. 27, figs. 2*).—This report of a study of the best methods of preparing fried foods at high altitudes and some of the factors affecting their quality and palatability is presented in two parts dealing, respectively, with frying potatoes and croquettes and frying dough mixtures. Much of the material in part 2 has been noted previously (E. S. R., 82, p. 698).

Practical directions are given for the preparation and frying of Saratoga chips, French-fried potatoes, shoestring potatoes, croquettes, doughnuts, and fritters, together with a number of recipes for doughnuts and doughnut glazing. A table is included of frying temperatures anud times for various foods at high altitudes, including in addition to the foods already listed timbale cases, fish, and scallops.

**Standardization of the scoring of test cakes,** O. E. STAMBERG. (Minn. Expt. Sta.). (*Cereal Chem., 16 (1939), No. 6, pp. 764–768, figs. 2*).—Standard scoring systems are presented for judging the volume, grain, and symmetry or shape of cakes made by the present tentative method of the American Association of Cereal Chemists. The scoring system is not applicable to cakes made from other formulas. For scoring volume, a scale for use with 325 gm. of batter assigns the perfect score of 15 to cakes with volumes from 940 to 920 cc.; a score of 14 to volumes from 920 to 900; and a progressive decrease in score with each 20-cc. decrease in volume, volumes of from 660 to 640 cc. scoring 1, and volumes less than 640 scoring 0.

As an aid for judging grain, a series of nine actual-size photographs (presented here as smaller reproductions) is offered, illustrating the appearance of cakes scoring from 24 down to 8 (by intervals of 2). As the scores decrease the cell walls become increasingly thicker and the grain coarser.

As an aid to standardized judging of symmetry or shape, a series of photographs of longitudinal cake sections is given. Cakes with slightly rounded tops and only slight breaks are given a perfect score of 10; scores of ±8, ±6, and ±4 are applied to cakes with increasing convexity (+) or concavity (−) of surface.

**Effect of dry milk solids on the keeping quality and batter stability of sponge cakes,** O. E. STAMBERG and C. H. BAILEY. (Minn. Expt. Sta.). (*Bakers' Helper, 71 (1939), No. 884, pp. 1104, 1105, figs. 2; abs. in Minnesota Sta. Rpt. 1939, p. 53*).—Essentially noted from another source (E. S. R., 81, p. 304).

**Mineral constituents of honey.—IV, Sodium and potassium,** H. A. SCHUETTE and W. W. WOESSNER. (Univ. Wis.). (*Food Res., 4 (1939), No. 4, pp. 349–353*).—Earlier studies in this series have reported on silica, iron, copper, manganese, calcium, phosphorus, magnesium, sulfur, and chlorine in honey.[*] In this fourth study data are presented on the ash, sodium, and potassium content. The values reported as averages for light and dark honeys and for subgroups, including, respectively, honeys classified as water-white and white and as light amber, amber, and dark, are based on analyses of 31 samples obtained from various areas in the United States and representing various flower sources. Maximum and minimum values also reported show a variation in sodium from 6 to 400 mg. per kilogram or from 0.96 to 11.20 gm. per 100 gm. of ash and in potassium from 100 to 4,733 mg. per kilogram or from 2.0 to 70.8 gm. per 100 gm. of ash. A larger content of alkali metals was apparently associated with an increasing degree of pigmentation, the differential between the major color groupings being greater

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[*] Jour. Amer. Chem. Soc., 54 (1932), No. 7, pp. 2909–2918; Food Res., 2 (1937), No. 6, pp. 529–538, fig. 1; 3 (1938), No. 5, pp. 543–547.

with respect to potassium than to sodium. The analytical methods are outlined, and data on the sodium and potassium content of floral honey, reported in the literature from 1908 to 1938, are summarized and discussed.

**Frozen fruit and vegetable research initiated by the station,** F. M. Coe. (Coop. U. S. D. A. et al.). (*Farm and Home Sci.* [*Utah Sta.*], *1* (*1940*), *No. 1, pp. 2, 4*).—A brief description is given of the organization and purpose of a research project on freezing preservation of Utah fruits and vetgetables, which is being conducted by various departments of the station. The method followed in the freezing of fruits, pulps, and purees is described briefly, with suggestions for the use of frozen products. Utah fruits and berries listed as especially promising for ice cream and sherbet uses are Chinese apricot, Carmen South Haven and Rosebud peach, Montmorency and Morello cherry, Cuthbert and Taylor red raspberry, Marshall strawberry, Santa Rosa plum, and Boysenberry.

**Quality of frozen pack peas and vitamin-C content of tomatoes investigated in home economics laboratory,** A. P. Brown (*Farm and Home Sci.* [*Utah Sta.*], *1* (*1940*), *No. 1, p. 6*).—In a brief progress report it is noted that frozen-pack peas were most satisfactory when cooked for 8 min. (actual boiling time) in water containing 0.005 percent salt; that of 21 varieties tested, Morse Market, dark-podded Thomas Laxton, Gradus, and Hundred-fold were given preference; and that samples of the 21 varieties gave vitamin C values (raw) ranging from 8 to 33 mg. per 100 gm. The Stone variety of tomatoes was found to have a vitamin C value of 28 mg. per 100 gm.

**The new Federal Food, Drug, and Cosmetic Act,** T. G. Klumpp (*Jour. Amer. Med. Assoc., 113* (*1939*), *No. 25, pp. 2233–2235*).—Features of particular interest to members of the medical profession in the Federal Food, Drug, and Cosmetic Act of June 25, 1938, are outlined briefly.

**Public health aspects of the Federal Food, Drug, and Cosmetic Act,** W. S. Frisbie. (U. S. D. A.). (*Amer. Jour. Pub. Health, 29* (*1939*), *No. 12, pp. 1292–1296*).—This address discusses the outstanding features from the standpoint of public health protection of the Federal Food, Drug, and Cosmetic Act of 1938 in contrast with the limited provisions in this respect of the act of 1906.

**The dietitian's place in the hospital research program,** A. F. Morgan. (Univ. Calif.). (*Jour. Amer. Dietet. Assoc., 15* (*1939*), *No. 10, pp. 853–859*).—A paper read at the 1939 meeting of the American Dietetic Association.

**The importance of dairy produce in the diet during the school age,** H. C. C. Mann (*Jour. Roy. Inst. Pub. Health and Hyg., 2* (*1939*), *No. 8, pp. 486–514, figs. 4*).—Included in this address is a comparison of diet schedules obtained from four English public schools for boys in 1922–26 with three schedules obtained by weighing the food eaten by boys in the homes of an industrial district in London. Attention is called to the inadequacy of the latter diets, particularly the negligible amounts of milk and butter, although a marked improvement is noted in the physical condition of the children in this industrial section in recent years as a result of milk distribution in the schools.

**The basal metabolism of Chinese children, ten to seventeen years of age,** L. C. Kung, C. P. Tsao, and S. D. Wilson (*Chin. Jour. Physiol., 14* (*1939*), *No. 4, pp. 431–437*).—Basal metabolism data obtained with the Benedict field apparatus are reported for 18 Chinese girls and 22 Chinese boys from 10 to 17 yr. of age, all of whom were born and raised in the Peiping region. The boys were from families in moderate and the girls in distinctly poor circumstances.

The results for the girls were somewhat higher than the values reported by Benedict and Meyer (E. S. R., 70, p. 562) for American-born Chinese girls from 12 to 22 yr. of age, but much lower than those reported by Wang and Hawks (E. S. R., 68, p. 410) for those from 5 to 17 yr. of age. The values for the boys

were lower than those reported by Wang and Hawks except on the basis of calories per centimeter of height, which were somewhat higher.

**Electrolyte and nitrogen metabolism in pregnancy,** H. E. THOMPSON, JR., and W. T. POMMERENKE (*Jour. Nutr., 17 (1939), No. 4, pp. 383–392, figs. 4*).—The studies were conducted on two women, on one during the fourth and eighth months of pregnancy over 10- and 11-day test periods, respectively, and on the other in the ninth month over a 5-day test period. These subjects, maintained under constant observation and supervision in a special study division of the hospital, received during the 3-day preliminary adjustment periods and the subsequent test periods a fixed diet complete with regard to vitamins A, B, C, and G and furnishing daily approximately 70 gm. of protein, 77 of fat, 230 of carbohydrate, 2.17 of calcium, 1.84 of phosphorus, and 0.005 gm. of iron. The items in the diet were analyzed for moisture, potassium, sodium, chlorine, and nitrogen, these same elements being determined in the serum from blood samples obtained at the beginning and end of the test period and in the urine and feces collected over this period. The analytical methods are noted, the clinical histories are presented, and the detailed results as to intake, output, and balance of the several elements are tabulated and presented.

The cumulative balances and the diurnal variations in retentions of the electrolytes are presented graphically. Based on the three metabolic studies, the average daily retentions of sodium and potassium amounted to 14.7 and 7.9 milliequivalents, respectively. The fluctuations in potassium retention varied less from day to day than did those of sodium and chlorine. The variations in sodium and chlorine appeared to parallel one another, but such was not the case with potassium and chlorine. The subjects were maintained in approximate chlorine equilibrium (average daily retention —0.3). The nitrogen balance was positive in only one period, the negative balances in the other periods being ascribed to the diarrhea present.

**Blood: A review of the recent literature,** C. C. STURGIS, R. ISAACS, S. M. GOLDHAMER, and F. H. BETHELL (*Arch. Int. Med., 63 (1939), No. 6, pp. 1190–1231; 64 (1939), No. 1, pp. 148–212*).—Of the many topics under which this extensive review of the literature published in 1938 on various phases of hematology is presented, attention is called particularly to the following: Pernicious anemia, macrocytic anemias other than pernicious, anemias associated with endocrine dysfunction, iron deficiency, anemia of pregnancy, polycythemia, blood clotting, bone marrow, and hematologic methods. An extensive list of literature references is given as footnotes.

**A quantitative study by means of spectrographic analysis of aluminum in nutrition,** F. I. SCOULAR (*Jour. Nutr., 17 (1939), No. 4, pp. 393–405, fig. 1*).—Thirty-five aluminum balance studies were made with three normal boys of preschool age. The diets, the methods for handling and collecting food and preparing aliquots for spectographic analysis, and the method used in reading the spectograms are discussed briefly. The same technics were used in earlier studies on copper and zinc (E. S. R., 82, pp. 419, 705). Recoveries within ±10 percent were obtained for 0.005 mg. of aluminum from samples containing 0.00065–0.0057 mg. The ingestion level of the aluminum varied from 0.014 to 0.030 mg. per kilogram of body weight, primarily because of natural variations in the foods used. Available data on the aluminum content of the foods indicated that the estimated values for the total diet were much higher than the values obtained by the spectrographic analyses.

The urinary and the fecal excretions of aluminum, varying, respectively, from 3 to 29 percent and from 38 to 127 percent of the ingested amount, bore no relation to the amount of aluminum ingested. Some aluminum was present in

all the urines, although the greater proportion of that ingested appeared in the feces. "Fifty percent of the balances were positive and 50 percent were negative. Sixty percent of all of these fell within the ±10-percent error as determined for the method used in this study. The amount of aluminum retained in the remaining 40 percent of the balances suggested that aluminum is not an essential constituent of the diets of preschool age children."

**Is iron excreted by the gastrointestinal tract of the dog? A histologic study**, S. Maddock and C. W. Heath (*Arch. Int. Med., 63 (1939), No. 3, pp. 584–589*).—This work involved repeated oral or parenteral administration of large doses of iron to dogs and a histologic study of the gastrointestinal tract and of an explant of the colon (with blood supply intact) on the abdominal wall of the dog. Pieces of tissue obtained at biopsy before and at various intervals after administration of the iron were fixed, stained for iron, and studied histologically.

After the iron dosage large deposits of iron were found in the spleen and in the liver, but only traces in the stomach, the intestine, the colonic explant, and the skin. These traces were present in the corium of the skin and in the connective tissue rather than the mucous cells of the gastrointestinal tract, indicating that this minute amount of iron was being held in storage rather than being in the process of excretion by these organs. This conclusion is considered to confirm the opinion of McCance and Widdowson (E. S. R., 79, p. 134) that the excretion of iron by the bowel is extremely small.

**The fate of calcium and magnesium after intravenous administration to normal persons**, R. A. McCance and E. M. Widdowson (*Biochem. Jour., 33 (1939), No. 4, pp. 523–529*).—Calcium and magnesium balance experiments were conducted for 14-day periods preceded by 2- to 3-day preliminary periods on six normal adults at two different levels of intake by mouth and finally during a period of parenteral administration. The experiments were managed in the manner described earlier by the authors (E. S. R., 82, p. 420).

The calcium intakes for the six persons per 14 days totaled 48.88 and 61.68 gm. at the lower and higher intake levels, respectively, the corresponding balances (half of which were negative at each level) totaling −2.03 and −1.00 gm. The ratios of urinary to fecal output at these two levels were similar, averaging 0.31 and 0.28 for the lower and higher intakes, respectively. In the third period when calcium (as the gluconate) was administered intravenously in amounts totaling 15.60 gm. for the six subjects in 14 days, the total intake, including that from the food, amounted to 68.31 gm. The calcium balances for the six subjects totaled only +2.52 gm. at this period, indicating that most of the ingested calcium was eliminated during the experiment. At this stage, in which the ratio of fecal calcium to food calcium was little changed from that of the preceding periods, the ratio of urinary calcium to fecal calcium increased to 0.63, indicating that the injected calcium had been almost entirely excreted by way of the kidney.

In the similar studies with magnesium, intakes in the periods of low and high intake from food and in the injection period totaled (for the six persons for 14 days) 22.80, 34.01, and 41.78 gm., respectively, the corresponding balance totals being +0.22, +0.73, and +2.19 gm. There was no significant change in the ratio of fecal magnesium to ingested magnesium during these periods. Ratios of urinary magnesium to fecal magnesium obtained in the successive periods were 0.70, 0.46, and 1.77. These values indicated that the kidney excreted very little of the extra magnesium taken by mouth, probably because it was not absorbed, but that it did excrete practically all of the injected magnesium. These experiments gave no evidence that additional calcium or magnesium was excreted into the gastrointestinal tract.

***The fate of strontium after intravenous administration to normal persons*, R. A. McCance and E. M. Widdowson** (*Biochem. Jour., 33 (1939), No. 11, pp. 1822–1825*).—The strontium excretion of two normal adults, determined for a 7-day preliminary period, amounted to 24 and 38 mg., respectively, for the weekly period. In an experimental period that followed immediately, 47 mg. of strontium (as the lactate) were injected intravenously every day for 5 days (the second subject received a preliminary smaller injection of 23.5 mg.). During this period 118 and 114 mg. of strontium were excreted by the two subjects, respectively, and an additional 40 and 14 mg. in the 2-day after-period. These total recoveries amounting, respectively, to 57 and 33 percent of the injected strontium indicated a slow excretion of the element.

Data reported for the fecal and urinary partitionment of the excreted strontium showed comparatively small increases in the fecal elimination of strontium in the injection period as compared with the preliminary period, but relatively great increases in the urinary excretion; a large proportion of this urinary strontium was excreted in the first 2 hr. after each injection. This relationship of fecal to urinary strontium, though more pronounced in the first subject, was carried over in each case to a lesser degree in the after-period. In summarizing the results it was found that 93 percent of the "recovered" strontium was eliminated by the kidney in the subject who had excreted 57 percent of the injected strontium and that 88.5 percent of the recovered strontium was thus eliminated by the other subject. "These results show that the kidney is the organ primarily responsible for the excretion of strontium once it has been absorbed from the gut." They lend no support to the view that strontium is eliminated by the intestines. The small increase in fecal excretion of strontium upon injection of the element is considered to suggest that some of the injected strontium may find its way to the intestinal juices and possibly replace an equivalent amount of calcium therein.

**Calcium resorption in the intestine of rats under the action of fats** [trans. title], B. and H. von Euler and M. Malmberg (*Ernährung, 4 (1939), No. 9, pp. 257–270, figs. 4*).—To determine whether the difference in the fatty acids characteristic of butter and of margarine would effect any difference in the retention of calcium fed in diets utilizing these respective fats, tests were carried out with rachitic rats which would be responsive to any differences affecting calcium utilization.

In one series young rachitic rats receiving 2 International Units of vitamin D daily were continued on the basal rachitic diet either as such or modified by reduction in calcium to give a favorable calcium: phosphorus ratio. With each of these basic diets there were lots receiving in addition to the vitamin 0.5 cc. of triolein and 0.5 cc. of ethyl laurate, respectively. Groups receiving no vitamin D or other supplements and others on a normal diet were carried as controls. The response of the various test groups, measured by the percentage of ash, calcium, and phosphorus in the bones, blood phosphorus, and roentgenographic findings, indicated that any variation in the healing of the rickets due to the influence of the fatty acids was too slight to be symptomatic.

Other groups of variable weight receiving vitamin D supplements were given calcium supplements of 31–37 mg., 10–15, or 6–7 mg. per day in three series, respectively; some animals in each series were carried as controls, while others were given margarine or butter in the basic diet, the intakes being calculated from food consumption records. The calcium retention, calculated from total intake minus calcium elimination in the urine and feces, was found not to be affected by the butter or margarine supplement.

**Recent vitamin research.—I, Vitamins A, D, E; II, Vitamins C, B complex, and the less well known vitamin factors**, J. E. Becker (*Jour. Amer.*

*Dietet. Assoc.*, *15* (*1939*), *No. 10*, *pp. 875–884*, *16* (*1940*), *No. 1*, *pp. 16–33*).—This review deals with recent progress in the fields of the chemical composition, synthesis, physiologic roles, and clinical uses of the vitamins listed and of vitamin K. The less well-known vitamins, the significance of which in human nutrition is as yet unknown, are listed in a table giving the names of the vitamins, the investigators who discovered them, the experimental animals used, and the ascribed functions. Extensive lists of references are appended to the two sections.

**Vitamin A determinations by means of rat growth tests,** F. J. Gorter and J. P. Spruyt (*Arch. Néerland. Physiol. Homme et Anim.*, *24* (*1939*), *No. 1*, *pp. 122–132*, *fig. 1*).—Young rats from mothers kept from the time of mating on a vitamin A-free diet were separated into groups at weaning and given graded amounts of the test material. Certain groups kept as negative controls received no vitamin A, while other groups as positive controls received 10γ, 7.5γ, 5γ, 2.4γ, or 1.8γ of β-carotene over a period of 70 days. Each group included four males and four females, so selected that the total weight and the growth expectations would be approximately the same for each group. The test material was fed over a period of 10 weeks, the average growth responses as plotted for the several test groups being compared with those plotted for the various positive controls receiving definite amounts of β-carotene. By means of the graphs, an estimation was made of the number of International Units of the vitamin that must have been ingested daily and the number of International Units per 100 gm. of test material. It is pointed out that the growth impulse of puberty was not a factor in these experiments, since under the tropical conditions present puberty normally was not attained until the age of 4½–5 mo.

Values determined by this method are reported for 18 East Indian fruits and vegetables, the latter including leaf and fruit forms, legumes, and bamboo shoots. Where values determined by chemical methods are available for these foods, comparison indicates lower results by this rat growth method.

**The vitamin A content of some commercially canned tomato juice,** C. F. Poe, O. K. Gant, and E. Griffin (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, *19* (*1939*), *No. 3*, *pp. 73, 74, 88*, *figs. 2*).—The methods of Sherman and Munsell and Sherman and Burtis were used in this study. In 15 samples of canned tomato juice bought on the open market in Colorado, minimum, maximum, and average values for the unfitered juice were 5.00, 8.74, and 7.12 Sherman units per cubic centimeter. In 5 samples of filtered juice selected from the larger number of original samples as representing the average vitamin A content of the entire lot, these values were 0.10, 0.14, and 0.12 unit per cubic centimeter.

**The slight accumulation of vitamin A in the egg of the hen and in the liver of the chick** [trans. title], M. Vermes, P. Meunier, and Y. Raoul (*Compt. Rend. Acad. Sci.* [*Paris*], *209* (*1939*), *No. 15*, *pp. 578–581*, *fig. 1*).—The kinetics of the Carr-Price reaction, as applied to a mixture of 70 percent of lutein and 30 percent of zeaxanthin, the proportions encountered in the egg yolk, and as applied to this mixture plus a small amount of vitamin A, was studied; the decrease in intensity of the blue color, as measured in the electrophotometer with a yellow filter, was plotted against time to give standard curves. The curve obtained with the latter mixture, sloping off rapidly at first and then more gradually in the second to fourth minutes, was similar to that obtained for the chloroform extracts of egg yolk or of chick liver. Such extracts were considered satisfactory to use, therefore, in the determinations that followed. From 300 to 800 International Units of vitamin A per egg were found in the samples tested, these values corresponding to 2,500–5,100 I. U. per gram of egg yolk, respectively. Boiling the egg for 6 min. caused no decrease in the vitamin A values. The livers of chicks 3 hr. old were found to contain on an average only about one-third as much vitamin

A as an egg yolk, and by the end of the eighth hour no trace of the vitamin A could be detected in the livers of chicks maintained on the Elvehjem deficiency regime (E. S. R., 68, p. 368) with the addition of coarse gravel and a small amount of calciferol. The livers of chicks sacrificed 2 hr. after ingestion, or even subcutaneous injection, of 700–2,800 I. U. of vitamin A, were found to have stored only minute amounts of the vitamin, no trace of which could be found after the eleventh hour. It is recommended, therefore, that vitamin A should be administered to chicks in frequent small doses rather than in a single massive dose.

**The serum vitamin A picture in fever** [trans. title], W. THIELE and I. SCHERFF (*Klin. Wchnschr., 18 (1939), No. 38, pp. 1275–1277, figs. 2*).—The serum of patients subjected to fever therapy was studied. It was found that the vitamin A content decreased, often sinking to very low levels, especially with higher elevations and the more prolonged treatments. The carotene content on the other hand changed very little, if at all. It is assumed, therefore, that the conversion of carotene to vitamin A, which takes place in the reticulo-endothelial system, is interfered with in fever, probably due to damage of the reticulo-endothelial system. No explanation is apparent as to the cause of the increase in the vitamin A content of the blood with the cessation of fever.

***Vitamin A deficiency in normal and tuberculous persons as indicated* by the biophotometer,** H. R. GETZ, G. B. HILDEBRAND, and M. FINN. (Univ. Wis.). (*Jour. Amer. Med. Assoc., 112 (1939), No. 14, pp. 1308–1311*).—Biophotometer tests by essentially the same technic as that of Jeans are reported for 300 healthy persons, of whom 229 were medical students and the remaining 71 home economics juniors, and 197 tuberculous patients, mostly fever-free and ambulatory, although representing minimal, advanced, and far advanced stages of the disease. Among the healthy controls, 6.55 percent of the medical students and 11.27 percent of the home economics students and of the tuberculous patients 53 percent proved to be pathologically deficient in vitamin A according to the classification used by Jeans, and 12.22, 15.49, and 23.35 percent, respectively, showed borderline deficiencies.

The results of vitamin A therapy are reported only for the controls. Daily doses of halibut-liver oil furnishing 20,000 units of vitamin A produced no change in 6 of the subjects showing the greatest deficiency in the biophotometer tests, and with the most deficient it required 200,000 units a day for about 2 weeks before a favorable response was secured, after which the dose was reduced to 100,000 units or less. In 5 subjects with borderline deficiency and 2 who were normal the response to 100,000 or more units of vitamin A was more prompt. In 3 weeks the minimum light threshold for all of these was reduced, and the subjects with borderline deficiency had become normal. These findings are thought to suggest that the state of vitamin A nutrition of biophotometrically normal persons can be improved, a suggestion confirmed by evidence along a different line. In urea clearance tests conducted by R. C. Herrin on 2 persons with normal biophotometric readings and 2 with borderline deficiency before and after several weeks' treatment with 100,000 or more International Units of vitamin A daily in halibut-liver oil, the values were almost doubled after the treatment.

**Vitamin $B_1$ Merck (thiamin chloride)** (*Rahway, N. J.: Merck & Co., [1939], pp. [2]+50*).—This annotated bibliography of papers published from 1937 to November 1939, inclusive, on the therapeutic uses of vitamin $B_1$ is classified under the headings polyneuritis, growth in children, nutritional heart disease, insulin shock therapy, hyperthyroidism, and miscellaneous conditions.

**The vitamin $B_1$ content of wheat, flour, and bread,** A. S. SCHULTZ, L. ATKIN, and C. N. FREY (*Cereal Chem., 16 (1939), No. 5, pp. 643–648, fig. 1; also in*

*Bakers Tech. Digest, 14 (1939), No. 6, pp. 103, 104, 107, fig. 1)*.—Using the fermentation method previously described (E. S. R., 79, p. 11), the authors have determined the content of vitamin $B_1$ in wheat fractions obtained in millstreams from three different mills and in a series of commercial breads. The millstream analyses for the one mill in which the germ is milled out show that the germ, the fraction of the wheat richest in vitamin $B_1$, actually contained only about 5 percent of the total $B_1$ of the wheat berry, while the bran contained nearly 38 percent, the shorts nearly 39, and the straight flour 18 percent of the total, which amounted to 5.7γ per gram of wheat. The distribution of vitamin $B_1$ in the milling fractions of the straight flour was short patent 0.56γ per gram of straight flour, first clear 0.216γ, second clear 0.35γ, and red dog 0.212γ per gram. Two special flours not usually available were obtained in the millstream for this particular flour, namely, first mids with a content of 0.3γ and third break with a content of 0.6γ per gram. The first of these two flours is estimated to represent the best 33 percent of the short patent flour and to be an example of a highly refined flour. The other constitutes about 3.5 percent of the short patent flour.

Three samples of white bread gave vitamin $B_1$ values of 410γ, 321γ, and 456γ per 1-lb. loaf; two of whole wheat bread 1,760γ and 1,620γ and two of a high vitamin yeast bread 1,650γ and 1,750γ per 1-lb. loaf.

**Vitamin $B_1$ in bread**, J. A. Tobey (*Bakers Tech. Digest, 14 (1939), No. 6, p. 62*).—The attention of the baking industry is called to the importance of vitamin $B_1$ in the diet and its low content in white bread. Various means of increasing the amount of vitamin $B_1$ in bread are noted.

**The action of vitamin $B_1$ in animal experiments** [trans. title], E. Tonutti and J. Wallraff (*Klin. Wchnschr., 18 (1939), No. 15, pp. 535, 536*).—Six groups of 11–17 male adult mice were kept on a vitamin $B_1$-free ration until they showed symptoms of beriberi and were then given vitamin $B_1$, glucose, and insulin in various combinations. Subsequent analysis of the livers for glycogen by the Best carmine stain method showed the presence of glycogen in 12 of the 15 animals which had been given vitamin $B_1$ and glucose and in 3 of 17 receiving vitamin $B_1$, insulin, and glucose. Glycogen was present in only 1 of 15 receiving glucose alone and of the same number receiving insulin and glucose and in none of the 11 receiving vitamin $B_1$ alone. A decrease in the symptoms of vitamin $B_1$ deficiency was noted in all cases in which glycogen was found in the liver.

Attention is called to the fact that vitamin $B_1$ alone did not relieve the deficiency, and that the favorable action of vitamin $B_1$ and glucose was in most instances offset by the action of insulin. It is concluded that the symptoms of beriberi are caused by a specific disturbance in carbohydrate metabolism rather than by merely a lack of vitamin $B_1$, and that saturation tests for vitamin $B_1$ in certain cases may give misleading results in indicating a satisfactory concentration in animals actually showing symptoms of vitamin $B_1$ deficiency.

**Metabolism of Vitamin $B_1$ in rats studied by the Drosophila sterile culture method**, E. G. Van 't Hoog (*Arch. Néerland. Physiol. Homme et Anim., 24 (1939), No. 1, pp. 1–24, figs. 19*).—The method is based upon the requirement of *Drosophila* larvae for aneurin for development to the stage of pupation. On an agar-salts-water medium at pH 3.5 and containing 300 mg. of autoclaved yeast per 5 cc. the *Drosophila* larvae died within 10 days without chrysalis formation. With a medium containing pure aneurin development was completed, the time from egg deposition to pupation being 11.7, 9.7, 8.8, 6.5, and 5.8 days for respective additions of ⅟16, ⅛, ¼, ½, and 1 μg. of aneurin per 5 cc. Using these standards of behavior for comparison, the aneurin content of unknown solutions was determined by noting the pupation response elicited by the addition of definite amounts of the test solution to the basic medium. Preliminary comparison of such assay

values with those obtained by the modified Jansen thiochrome technic indicated that the *Drosophila* sterile culture method determines cocarboxylase as well as free aneurin.

Digestion of the whole rat or of isolated organs in boiling hydrochloric acid was found not to destroy any of the aneurin present. Such digests properly diluted served conveniently for studying the vitamin $B_1$ metabolism in rats. Concentrated digests could not be used, apparently because of the presence of inhibiting substances of animal origin; likewise, the method was not found applicable to determinations of blood or urine. The vitamin $B_1$ content of milk was easily estimated, however. The total vitamin $B_1$ content of rats (150 gm.) that had lived for 3 weeks on a diet free of vitamin $B_1$ was about 50 $\mu$g., whereas normally fed rats of the same weight contained about 300 $\mu$g. Depleted rats receiving large single doses of aneurin orally or by injection readily adjusted their aneurin content to that of normally fed rats. The latter, however, did not appreciably increase the aneurin content of their tissues upon receiving large doses. The brain and liver of normally fed rats were found to contain, respectively, 2–3 and 18 $\mu$g. of aneurin per gram of tissue. After 3 weeks of depletion, the amount in the brain was not less than normal but the amount in the liver was greatly reduced.

**Endogenous disturbance in the utilization of vitamin $B_1$** [trans. title], S. Molnár and J. Petrányi (*Klin. Wchnschr., 18 (1939), No. 35, pp. 1191–1193, fig. 1*).—The case report given concerns a patient suffering with trigeminal neuralgia who received as treatment daily subcutaneous injections of 10 mg. of vitamin $B_1$. There was no abatement of the pain with this treatment, and from 80 to 88 percent of the injected vitamin $B_1$ was found to be eliminated in the urine. When this treatment was supplemented with simultaneous intramuscular injection of 10 cc. of adrenal cortex hormone, cortin, there was relief of the pain, and the vitamin $B_1$ elimination fell to a level representing about 56 percent of the injected dose. Withdrawal of the simultaneous cortin injections brought about recurrence of the high elimination (about 90 percent) of the vitamin $B_1$; upon further resumption of cortin injections only about 34 percent of the large injected doses of vitamin $B_1$ were eliminated. It was postulated that the adrenal cortex hormone normally functions in the phosphorylation of vitamin $B_1$ to the active ester form, and that there was adrenal insufficiency in this particular patient. This insufficiency was shown by the characteristic histological picture of the adrenals of guinea pigs receiving abdominal injections of serum dialysate of the patient in question.

**A survey of the rat-bradycardia method of estimating vitamin $B_1$**, A. Z. Baker and M. D. Wright (*Biochem. Jour., 33 (1939), No. 8, pp. 1370–1374, fig. 1*).—This summary of the authors' experience of several years with the bradycardia method of determining the vitamin $B_1$ content of foods, using the technic and basal diet of Birch and Harris (E. S. R., 73, p. 567), includes a discussion of the reliability and specificity of the method, the necessary precautions in its use, and a table giving the doses employed for substances of different activity and the actual limits of error determined directly for each assay. The method "has been found useful for materials possessing widely different degrees of activity, from a rice containing as little as 0.3 I. U./gm. to concentrates containing 200 or more I. U./gm. When the substance to be tested is such that it can be diluted accurately, the method is applicable to materials of high activity such as crystalline aneurin."

**Cocarboxylase (vitamin $B_1$ diphosphate) in blood**, R. S. Goodhart and H. M. Sinclair (*Jour. Physiol., 95 (1939), No. 3, pp. 57P–59P*).—Values obtained by the method of Ochoa and Peters (E. S. R., 82, p. 278) are reported for various species as follows: Human blood (mean of 21 samples) 7.0±1.9 $\mu$g.

per 100 cc., ox (5) 5.7±1.5, normal pigeon (5) 20.2±9.8, and avitaminous pigeon (5) 5.6±0.8 μg. per 100 cc. The high values for normal pigeon blood suggested that the nucleated erythrocytes may play a part in the phosphorylation of the vitamin, and evidence in support of this theory is summarized from incubation tests of nucleated blood cells with vitamin $B_1$ in phosphate buffer. "It seems then that nucleated blood cells that have originated in the bone marrow convert vitamin $B_1$ into cocarboxylase which is combined probably with protein. Possibly this ability to phosphorylate the vitamin is common to all nucleated cells and varies with the individual needs of the cell."

**The estimation of cocarboxylase (vitamin $B_1$ diphosphate ester) in blood,** R. S. GOODHART and H. M. SINCLAIR (*Biochem. Jour., 33 (1939), No. 7, pp. 1099–1108, figs. 4*).—The method, which is noted in detail, depends upon the ability of yeast in a properly buffered nutrient solution to produce $CO_2$ from pyruvic acid in the presence of cocarboxylase. By using yeast washed free of the cocarboxylase as the standard yeast preparation, the $CO_2$ produced in the presence of blood can be taken as a measure of the cocarboxylase in the blood. The determination may be made quantitative by comparing the volume of $CO_2$ produced in a 30-min. period with that formed by known amounts of cocarboxylase added to the system. Due to variability in yeasts, a standard curve ($CO_2$ production against quantity of cocarboxylase) is necessary for each new batch of yeast.

The results of 36 estimations of cocarboxylase in samples of blood from 26 normal male adults are presented. The mean value is 7.0 μg. per 100 cc., $\sigma=2.1$. Evidence was obtained indicating that all the cocarboxylase present in blood is in a combined form and occurs in the blood cells; the polymorphonuclear leucocytes contain more than the lymphocytes, and the nonnucleated erythrocytes contain least. Evidence is presented for the belief that nucleated blood cells can phosphorylate vitamin $B_1$ and that a freely diffusible form of vitamin $B_1$ exists in the blood in addition, probably, to a form in combination with protein. It is considered that the vitamin is probably carried to the tissues as free vitamin $B_1$ or its monophosphate ester and not as cocarboxylase.

**The estimation of vitamin $B_1$ in cerebro-spinal fluid,** H. M. SINCLAIR (*Biochem. Jour., 33 (1939), No. 11, pp. 1816–1821*).—A method similar to that described for blood (E. S. R., 82, p. 298) is presented for estimating vitamin $B_1$ in 1- to 4-cc. samples of cerebrospinal fluid. The method gives approximately true values, but is considered useless for clinical purposes since the amount of the vitamin present is extremely small and zero values were obtained in cases where it seemed there could have been no vitamin deficiency.

It is shown that vitamin $B_1$ in normal cerebrospinal fluid is free and unphosphorylated, with a normal range of concentration of 0.0–1.3 μg. per 100 cc. This, it is pointed out, is of the same order as the amount of free phosphorylated vitamin in human blood plasma. Pathological samples of fluid tended to give higher values, which showed a positive correlation with the white cell count. The results are discussed in relation to other work on vitamin $B_1$.

**Relationship between nicotinic acid and a codehydrogenase (cozymase) in blood of pellagrins and normal persons,** R. W. and S. P. VILTER and T. D. SPIES (*Jour. Amer. Med. Assoc., 112 (1939), No. 5, pp. 420–422*).—Prolonged treatment of several hundred pellagrins with nicotinic acid showed that many cases required increased doses from time to time to prevent recurrence of acute symptoms. Preliminary studies with four selected endemic pellagrins maintained on a pellagra-producing diet with daily supplements of 100–400 mg. of synthetic nicotinic acid and 10 mg. of synthetic vitamin $B_1$ indicated further that the improvement first effected was but temporary (about 2 mo.). After

about 12 mo. on this regime marked improvement within 48 hr. was again noted upon the administration of 50-mg. doses of riboflavin on 2 successive days. These observations suggest that nicotinic acid is probably used by the body as a component of some enzyme system, and that riboflavin, which is beneficial to certain pellagrins in relapse, may be involved in the same biochemical system

The therapeutic effect of nicotinic acid, as shown by an increase in active enzymes in the blood, was demonstrated in experiments in which the growth of influenza bacilli in serial dilutions of human blood was used as a measure of the amount of cozymase (coferment or factor V) present. This experiment, reported in some detail, showed that the blood of normal persons on well-balanced diets supports growth of *Bacillus influenzae* to a much greater extent than the blood of pellagrins on diets deficient in the pellagra-preventive factor. After nicotinic acid therapy, however, the blood of pellagrins increases to normal growth-promoting activity, indicating a significant increase in blood cozymase after nicotinic acid therapy.

***Chemical reactions of nicotinic acid amide in vivo***, E. G. BALL (*Bul. Johns Hopkins Hosp., 65 (1939), No. 3, pp. 253–264, figs. 5*).—According to this review of the literature on the role in biological oxidations of compounds containing nicotinic acid amide, "the pyridine nucleotides constitute reversible oxidation-reduction systems whose functional group is nicotinic acid amide. In combination with specific proteins these reversible oxidation-reduction systems play a central role in the initial reactions by which carbohydrates and amino acids undergo oxidation and synthesis in the animal organism. These initial reactions, however, in which the pyridine nucleotides play a cyclic role, are dependent on secondary reactions in which, among other factors, flavoprotein and cocarboxylase play an important part. It is thus obvious that at least three vitamins of the B group, thiamin, riboflavin, and nicotinic acid, are collectively concerned in biological oxidations and that any investigation of the role of one of these demands a consideration of the other two." A bibliography of 44 titles covering chiefly work published in 1933–39, inclusive, is appended.

**Riboflavin Merck** (*Rahway, N. J.: Merck & Co., [1940], 3. rev., pp. [2]+39*).—This is the third revision (January 1940) of a general review of the literature on riboflavin, including chemistry, methods of assay, toxicity, applied physiology and pharmacology, adequacy of the American dietary, dosage, and therapeutic uses. A bibliography of 128 references is appended.

**Effect of cooking on the riboflavin and vitamin $B_6$ content of pinto beans**, E. M. LANTZ (*New Mexico Sta. Bul. 268 (1939), pp. 16, figs. 5*).—In this extension of an investigation of the content of the various factors in the B complex in pinto beans (E. S. R., 79, p. 423), the riboflavin content was determined by comparing the gains in weight of rats fed the beans as the sole source of riboflavin with those of similar rats fed graded doses of pure riboflavin, and the vitamin $B_6$ content by comparing the incidence of dermatitis in rats fed the beans as a source of vitamin $B_1$ with that of similar rats fed graded doses of an autoclaved rice polish concentrate. The basal diets were essentially those of Bender and Supplee for riboflavin and György for vitamin $B_6$. The same cooking methods were employed as in the earlier study of vitamin $B_1$

The rats were unable to utilize either the robiflavin or the vitamin $B_6$ from raw beans, but the cooked beans were well utilized. Differences in the riboflavin content with differences in the method of cooking were slight, and the amount of the vitamin lost in discarding the soaking water was neglibile. The estimated riboflavin content of the cooked beans was from 4 to 8 $\mu g$. per gram. The cooked beans were very effective in preventing dermatitis characteristic of vitamen $B_6$ deficiency. When cooked in distilled water without soaking the

beans afforded complete protection against dermatitis in daily doses of 0.75 gm. When the beans were soaked before cooking a considerable fraction of the vitamin was dissolved in the soaking water. Pressure cooking or the addition of baking soda to the cooking water caused marked destruction of the vitamin.

Qualitative evidence was secured that cooked wheat, corn, soybeans, and hegari are better sources of riboflavin than the corresponding raw grains, although the differences were not as marked as in the pinto beans.

**The riboflavin and vitamin $B_6$ content of pinto beans and the effect of cooking on these factors**, E. M. LANTZ. (N. Mex. Expt. Sta.). (*Jour. Home Econ., 32 (1940), No. 2, pp. 107–112*).—Essentially noted above.

**Vitamin $B_6$** (*Rahway, N. J.: Merck & Co., [1940], pp. [1]+20*).—This annotated bibliography of 80 references is arranged in chronological order to trace the concepts of the existence of vitamin $B_6$ and the steps leading to its isolation and synthesis.

**Role of manganese in the biological synthesis of ascorbic acid**, M. N. RUDRA (*Nature [London], 144 (1939), No. 3655, p. 868*).—In continuation of earlier work on rats (E. S. R., 82, p. 711), evidence is presented that the guinea pig liver can also synthesize ascorbic acid from sugar precursors (mannose and galactose) both in vitro and in vivo, although a higher concentration of manganese is required. "The hypothesis is advanced that the inability of the guinea pig and man to synthesize their requirement of ascorbic acid is due to the lack or insufficiency of manganese in their tissues. The active oxidative or dehydrogenating mechanism is made up of manganese and the dehydrogenase, manganese acting in the capacity of a coenzyme."

**Ascorbic acid in blood and urine after oral administration of a test dose of vitamin C: A saturation test**, G. A. GOLDSMITH and G. F. ELLINGER (*Arch. Int. Med., 63 (1939), No. 3, pp. 531–546, figs. 4*).—Tests with 22 adults given orally and in the fasting state 600-mg. doses of ascorbic acid indicated that the elimination within 6 hr. after administration was practically as great as in a 24-hr. period. The amount excreted was found to increase with increase in the fasting blood level of ascorbic acid. When the latter level of ascorbic acid exceeded 1.4 mg. per 100 cc., the urinary excretion increased. The reduced ascorbic acid content of the blood after a test dose of 600 mg. of ascorbic acid rose in most cases to a maximum within 3 hr. after the injection. It is proposed, therefore, that the state of vitamin C nutrition be determined by measuring the excretion of ascorbic acid in the urine for 6 hr. after the administration of 600 mg. of this substance. An alternate procedure suggested consists in the determination of the amount of reduced ascorbic acid in the blood during fasting and at the end of 1 hr. and of 3 hr. after the administration of a similar test dose. Criteria of normal vitamin C nutrition, of saturation, and of depletion of the tissues are enumerated for each of these tests.

**The physiological significance of l-ascorbic acid (vitamin C) content of human tonsils and the relation of l-ascorbic acid to the protective function of the tonsils** [trans. title], H. H. MEYER (*Klin. Wchnschr., 18 (1939), No. 20, pp. 704–708*).—In this attempt to explain the significance of vitamin C in the tonsils ascorbic acid was isolated from human and ox tonsils by a precipitation and ultrafiltration method, which is outlined briefly, and identified by micromelting point determinations, microchemical reactions, and crystalline form; a much higher content of ascorbic acid was found in human tonsils from subjects receiving an abundance of vitamin C than in others suffering from severe infections at the time of tonsillectomy; the bactericidal action of vitamin C was determined in vitro against pneumococci and streptococci and in vivo through an increase in phagocytic value of the blood; and finally, the synthesis

of ascorbic acid in tonsil tissue by glucose, maltose, or sucrose was demonstrated. The author concludes that the tonsils, through their vitamin C content, contribute to the defensive action of the body against infection.

**Vitamin C and light**, E. MURPHY. (Maine Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 35 (1938), pp. 498, 499*).—Computations by Student's method of mean differences in ascorbic acid content of the "sunny" and the "shady" sides of apples comprising 50 pairs of tests, using 9 varieties, are reported.

In 15 of 18 pairs of determinations on comparable peeled samples, the ascorbic acid content of samples from the sunny side exceeded that of those from the shady side, with a mean difference of 0.0150±0.0022 mg. per gram, with odds of 6,498 to 1 that the difference was significant. In 10 of 11 pairs of determinations on unpeeled samples the mean difference was 0.0252±0.0028 mg. per gram, with odds of 9,999 to 1 that the difference was significant. In 17 of 21 pairs of analyses of peeled sunny with unpeeled shady sides of the same apple, the mean difference was 0.0139±0.0022 mg. per gram, with odds of 3,145 to 1 that the difference was significant. It is suggested that this variation within the same fruit may account in part for the lack of agreement frequently noted in published data on the vitamin C content of a given fruit or vegetable.

**Alpha-tocopherol—vitamin E** (*Rahway, N. J.: Merck & Co., [1939], pp. [2]+93*).—This (for the most part annotated) bibliography, compiled September 1939, includes more than 500 references arranged alphabetically by author.

**Quantitative biological assay of vitamin K and its application to several quinone compounds**, F. P. DANN (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 2, pp. 663–668*).—The method developed uses the diet and blood-clotting technic of Almquist and Stokstad (E. S. R., 78, p. 377) and the 3-day curative period of Dam and Glavind,[4] administers the vitamin K orally in test doses given to chicks individually, and uses a vitamin K standard as a positive control for each group of chicks. The results with this 3-day curative method indicate that it is quantitatively within the limits of error for a biological assay if certain precautions, which are discussed, are observed in the procedure. The vitamin K activity of a compound was found to vary significantly with the solvent and the method of administration. The vitamin K activity of 2-methyl-1,4-naphthoquinone and of 2-methyl-1,4-naphthoquinhydrone was found to be approximately the same as that of the natural vitamin $K_1$ on a molar basis.

**Clinical and experimental studies on vitamin K**, H. P. SMITH, S. E. ZIFFREN, C. A. OWEN, and G. R. HOFFMAN (*Jour. Amer. Med. Assoc., 113 (1939), No. 5, pp. 380–383, fig. 1*).—A rapid method sufficiently simple for bedside application is described for the detection of vitamin K deficiency. Freshly drawn blood is added to 0.1 cc. of thromboplastin in a small serologic tube to a total volume of 1 cc.; the contents are immediately mixed by inversion, the tube then being tilted every second or two to observe clotting. As a control, the test is carried out on a normal subject. The clotting activity, expressed as percentage of normal, is calculated as 100 × the ratio of clotting time of the normal control to the clotting time of the patient's blood. The thromboplastin is prepared as a physiologic saline (0.9 percent) extract of ground fresh lung of ox or rabbit, 1 cc. of solvent being used per gram of tissue, and the extract being strained through gauze.

The new test is considered to be less specific for prothrombin than the two-stage method previously described by Smith, Warner, and Brinkhouse,[5] but results by the two methods were found to show excellent correlation; this is indicated by the chart presented for the illustrative case reported. Experience

[4] Biochem. Jour., 32 (1938), No. 6, pp. 1018–1023, fig. 1.
[5] Jour. Expt. Med., 66 (1937), No. 6, pp. 801–811, figs. 4.

with many patients having biliary fistulas or obstructive jaundice showed that bleeding commonly occurs when the test gives values of 40 percent or less and that values as low as 15 percent of normal may be obtained in extreme cases. Values from 40 to 70 percent are considered to be in the danger zone. It is pointed out that vitamin K therapy, though valuable in cases of bleeding tendency associated with biliary fistulas or obstructive jaundice, is of no value in hemophilia or thrombocytopenic purpura, since there is no deficiency of vitamin K or prothrombin in these latter diseases.

**The preoperative and postoperative administration of vitamin K to patients having jaundice,** H. R. Butt, A. M. Snell, and A. E. Osterberg (*Jour. Amer. Med. Assoc., 113 (1939), No. 5, pp. 383–390, figs. 5*).—A number of case reports are presented, indicating that prothrombin deficiency is associated with the predisposition to hemorrhage associated with obstructive jaundice and that the condition can be controlled by vitamin K. The dosage and administration of the vitamin preparation, obtained as certain fat-soluble material present in alfalfa, is considered. It is pointed out in discussion that the control of a prothrombin deficiency is dependent upon several factors, namely, a normal diet containing the antihemorrhagic vitamin, the presence of adequate amounts of bile salts in the intestine, a normal intestinal absorptive surface, and a physiologically normal liver. In clinical experience it has been found that in a majority of patients suffering from obstructive jaundice the second and the fourth factors may be impaired singly or more usually in combination. For successful treatment it is considered important to anticipate the danger of prothrombin deficiency and to detect it by means of laboratory studies.

**Factors influencing plasma prothrombin in the newborn infant.—I, Prematurity and vitamin K,** L. M. Hellman and L. B. Shettles (*Bul. Johns Hopkins Hosp., 65 (1939), No. 1, pp. 138–141*).—Data reported on plasma prothrombin levels, as determined by the method of Smith, Warner, and Brinkhous in 18 mothers and 19 full-term newborn infants, averaged 102.5 and 22.2 units, respectively. In 8 mothers and 9 premature infants the averages were 126.9 and 8.3 unts, respectively. Two mothers receiving 3,100 units of vitamin K per day prior to delivery, 1 for 16 and the other for 30 days, showed increases from 120 and 94 units at the beginning of the treatment to 274 and 158 units, respectively. Their normal full-term infants had plasma prothrombin levels of 77 and 83.8 units. Two infants given 1,000 units of vitamin K in their formulas each day for 4 days showed increases in prothrombin from 11.2 and 14.0 units at birth to 33.0 and 82.1 units, respectively. These preliminary studies indicated that very low infant prothrombin levels can be raised by feeding vitamin K to the mother prior to delivery or directly to the infant after birth.

**Control of prothrombin deficiency in obstructive jaundice by use of vitamin K,** J. D. Stewart and G. M. Rourke (*Jour. Amer. Med. Assoc., 113 (1939), No. 25, pp. 2223–2227, figs. 3*).—Case reports showed striking uniformity in prothrombin deficiency in obstructive jaundice and prompt and satisfactory response to the administration of vitamin K-cholic acid mixture except in the case of rapidly progressive liver damage. Abnormally high prothrombin values were not observed after treatment in the jaundiced patients studied, and the vitamin K-cholic acid treatment for several days of patients with normal initial prothrombin values brought about no significant change in prothrombin concentration. The importance is emphasized of giving vitamin K very promptly after operations on the biliary tract, as well as administering dextrose and proper fluids to aid liver function. Discussions by H. P. Smith, H. R. Butt, L. W. Frank, and J. D. Stewart contribute further to vitamin K therapy.

**Diseases of metabolism and nutrition: Review of certain recent contributions, I, II** (*Arch. Int. Med., 63 (1939), No. 2, pp. 356–427*).—This annual review (E. S. R., 80, p. 568), with 272 references, is in two parts.

I. *Diseases of metabolism*, R. M. Wilder and D. I. Rutledge (pp. 356–385).—The metabolic diseases discussed include diabetes mellitus, hemochromatosis, glycogenosis, diabetes insipidus, obesity, gout, alkaptonuria and related conditions, Bence Jones proteinuria, and acidosis and alkalosis.

II. *Nutrition*, D. L. Wilbur (pp. 385–427).—This section is devoted chiefly to vitamins, recent literature on which is discussed with respect to chemistry and physiology, requirements, and therapy.

**[Deficiency diseases]** (*In Acta Conventus Tertii de Tropicis Atque Malariae Morbis. Amsterdam: Soc. Neerland. Med. Trop., 1938, pt. 1, pp. 93–202, figs. [3]*).—Among the papers presented under this topic at the Third International Congress of Tropical Medicine and Malaria held at Amsterdam, September 1938, are the following: Deficiency Disease, by R. McCarrison (pp. 93–102); Diseases of Deficiency and Principally Deficiency in Protective Foods in the French Colonies [trans. title], by A. Thiroux and G. Mouriquand (pp. 103–113); Calcium and Phosphorus Deficiency in Relation to the Production of Osteodystrophic Diseases, by P. J. du Toit and A. I. Malan (pp. 115–126); the Requirement of Vitamins $B_1$ and C [trans. title], by W. Stepp (pp. 127–133); The Desirability of Studies on Mineral Deficiencies in the Tropics, by B. Sjollema (pp. 134–138); The New Chemistry of Aneurin (=Vitamin $B_1$) and the Control of Beriberi, by B. C. P. Jansen (pp. 139–141); Questions Concerning the Pathology of "Acute" Beriberi [trans. title], by K. F. Wenckebach (pp. 143–147); The Mass Prevention of Deficiency Diseases, by A. C. Reed (pp. 148–157); The Deficiencies of the Poor Rice Eater's Diet, by W. R. Aykroyd (pp. 158–163); The Role of Nicotinic Acid in Human Nutrition, With Special Reference to Pellagra, by T. D. Spies (pp. 164–173); The Action of Vitamin A on Experimentally Produced Skin Wounds [trans. title], by G. Joachimoglu and E. Sotiriadou (pp. 186, 187); The Reciprocal Influence of Avitaminosis A and C and Intestinal Protozoan Parasitism—Study of Scorbutic Diarrheas [trans. title], by G. Mouriquand and L. Morenas (pp. 188–194); and The Significance of the $B_2$ Complex in Human Pathology, by C. D. de Langen (pp. 196–201).

**The influence of phytin and of fats on the production of rickets by a cereal diet,** N. Palmer and J. C. Mottram (*Biochem. Jour., 33 (1939), No. 4, pp. 512–515*).—Rats maintained for 5 weeks on a rachitogenic diet of 75 percent white flour and 25 percent sterilized wheat germ developed severe rickets, as evidenced by line test results and a low bone ash (28.3 percent). With 0.75 percent calcium lactate added to the diet, the severity of the rickets decreased, and with additions amounting to 1.5 and 3.0 percent, respectively, the line tests showed absence of rickets and bone-ash values increased to 50.68 and 60.7 percent, respectively. These results confirm previous findings that the tendency of cereals to produce rickets resides in their low calcium and high phosphorus contents and that this tendency can be entirely counteracted by adding calcium lactate to make the calcium: phosphorus ratio 1:0.5.

When phytin from levels of 0.75 to 5 percent was added to the germ flour ration, 1.5 percent greatly reduced the rickets and 5 percent completely prevented it, as judged by line test results and the high (52.8 percent) bone-ash value. The results suggested further that the rat was able to utilize a higher percentage of phytin phosphorus than McCance and Widdowson (E. S. R., 76, p. 419) considered available to human subjects. In contrast to the findings of McDougall (E. S. R., 79, p. 705), the addition of a vegetable oil free from vitamin D did not prevent the occurrence of rickets resulting from a cereal diet.

**Phytic acid and the rickets-producing action of cereals,** D. C. Harrison and E. Mellanby (*Biochem. Jour., 33 (1939), No. 10, pp. 1660–1680, pl. 1*).—In the experiments described and reported in detail, phytic acid compounds and fractions prepared from cereals were added to control diets of a type producing slight rickets in puppies or just preventing it. Information is reported on the radiographic appearance of the epiphyseal ends of the bones and the degree of calcification. These findings were confirmed by observations as to the appearance of the dog and the histological appearance of the bones.

It was found that commercial phytin (CaMg phytate) at the level of 0.6–0.9 gm. daily had an antirachitic influence and improved calcification. On the other hand equivalent amounts of phytic acid (inositolhexaphosphoric acid) and of neutral Na phytate, whether prepared from commercial phytin or obtained from oatmeal, exerted powerful rickets-producing actions when added to the control diets. The rachitogenic activity of these compounds was roughly comparable with that shown by oatmeal when fed in an amount equivalent as regards phytic acid P.

The rachitogenic action of the Na phytate was abolished by the addition of extra calcium to the diet. This effect and the slightly antirachitic action of the CaMg phytate (commercial phytin) suggests that the rachitogenic action of cereals is due not, as has often been suggested, to the unavailability of this phosphorus but to the action of the cereal phytic acid in inhibiting absorption of calcium from the alimentary canal. Since the amount of phytic acid in oatmeal is approximately twice that required to precipitate the calcium of the cereal at neutrality, it is suggested that the phytic acid exerts its rachitogenic action by preventing absorption both of the calcium of the cereal itself and of further amounts from the rest of the diet. From the point of practical human nutrition it is pointed out that the rachitogenic action of cereals is likely to be operative only in diets which are on or below the borderline of minimum requirements of calcium and vitamin D; in practice this effect would be overcome by increasing the calcium rather than the phosphorus intake.

**Total and phytic acid phosphorus in foods,** E. F. Yang and M. Y. Dju (*Chin. Jour. Physiol., 14 (1939), No. 4, pp. 473–478*).—Data are reported on moisture, total phosphorus, and phytin phosphorus in cereals and cereal products (10 samples), legumes and legume products (19), and cucurbits, roots, greens, and other vegetables (a total of 43 samples) obtained on the Shanghai market. Total phosphorus was determined by A. O. A. C. methods and phytin phosphorus by the technic of McCance and Widdowson (E. S. R., 76, p. 419) but using the Fiske and Subbarow (E. S. R., 55, p. 310) method for phosphorus.

For corn, millet, and rice analyzed as whole grains, values of 47, 47.5, and 76.5, respectively, are reported for phytin phosphorus expressed as percentage of total phosphorus. Lower values for polished rices and for wheat flour containing only part of the bran indicate that the bran layer is high in phytin content. Forty-three percent of the phosphorus of dried soybeans was found to be phytin phosphorus; for fresh soybeans, fresh peas, dried horsebeans, and peanuts, corresponding values of 35.7, 23.2, 25.3, and 42.4 are reported. In potatoes 15 percent of the phosphorus was in the form of phytin phosphorus, but in all other vegetables this percentage was low (0–7). It has been calculated that 24.5–50 percent of the total phosphorus in some typical diets in Shanghai is in the form of phytin.

**Experimental chronic cadmium poisoning,** R. H. Wilson and F. DeEds. (U. S. D. A. et al.). (*Science, 90 (1939), No. 2343, p. 498*).—This is a preliminary report of the toxic effects produced by continued feeding of albino rats with an adequate diet to which cadmium chloride had been added at levels affording cad-

mium concentrations of 0.0031, 0.0062, 0.0125, 0.025, and 0.05 percent. The symptoms of toxicity observed were bleaching of the enamel of the incisor teeth (very similar to that produced by fluorides), anemia, and cardiac hypertrophy. The first two symptoms were present at all dosage levels, the severity increasing with increase in cadmium in the diet; the cardiac hypertrophy, believed to be due to the anemia rather than hypertension resulting from kidney damage, was most evident with cadmium concentrations of 0.0062, 0.0125, and 0.025. At the 0.05 concentration the rats died before the hypertrophy could fully develop.

**Fluorosis in rats due to contamination with fluorine of commercial casein: The effects of darkness and of controlled radiation upon the pathology of the teeth,** H. C. Hodge, E. M. Luce-Clausen, and E. F. Brown (*Jour. Nutr., 17 (1939), No. 4, pp. 333–346, figs. 5*).—Abnormalities observed in the teeth of rats receiving fluorine as a contaminant in an otherwise standard diet are described, the observations being incidental to a study on the effects of isolated radiation (visible and infra red) on growth and reproduction. Measurements of tooth length showed a great increase of the upper incisors, and measurements of the color of the teeth showed marked diminution in all affected as compared with normal animals. In the affected rats the eruption rate of the teeth was slower than normal. "The measurements of length and color of the teeth gave some evidence that the presence of fluorine in the diet intensified the effects of lack of radiation in the affected animals." The casein in question, constituting 15 percent of the ration, was found by chemical analysis to contain 0.2 percent of fluorine (0.1 percent by spectroscopic analysis). The source of the contamination was not known. Other lots and other sources of commercial and purified casein were found free of fluorine, and it is pointed out that fluorine contamination is probably not common.

**Effect of fluorides on salivary amylase,** F. J. McClure (*Pub. Health Rpts. [U. S.], 54 (1939), No. 49, pp. 2165–2171*).—The effect of fluorides on the activity of salivary amylase was studied at a reaction pH of approximately 6.6 (maintained by a phosphate buffer), activation of the enzyme being assured by the addition of NaCl to the soluble starch substrate. In one series of tests the salivas in 1:10 dilutions were permitted to stand for 1 hr. in the cold, with the fluorides NaF, KF, $NH_4F$, and $Na_2SiF_6$ in concentrations from 1.7 to 8,550 p. p. m. Amylolytic activity tested after this period showed no decrease in comparison with control tests in the absence of fluorides. The same fluorides, when present in the enzyme-substrate mixture during the digestion period in concentrations varying from 0.76 to 760 p. p. m. of fluorine in the substrate, likewise had no final effect on enzyme activity. Tests of salivas obtained by Dean et al. (E. S. R., 82, p. 713) from school children at Galesburg, Ill., where the water supply contained 1.8 p. p. m. of F and from others at Quincy, Ill., where the drinking water contained no F, showed no differences in amylolytic activity, indicating that fluoride at this low concentration in the drinking water exerts no physiological effect on the salivary amylase as secreted.

## TEXTILES AND CLOTHING

**The capacitance of textile materials in relation to moisture content,** B. Bailey and E. L. Phelps. (Minn. Expt. Sta.). (*Textile Res., 9 (1939), No. 3, pp. 101–113, figs. 2; abs. in Minnesota Sta. Rpt. 1939, pp. 31, 32*).—The present problem was undertaken to ascertain the change in capacitance, or the so-called dielectric constant, of the major textile fibers with variation in moisture content, to observe the difference in values obtained with fibers of different origin or chemical nature, and to determine the usefulness of the Burton-Pitt apparatus

employed for the measurement of the moisture content of textile fibers and fabrics. Cotton fiber, wool yarn, and rayon, cotton, linen, and silk fabrics (the last both as purchased and after washing) were studied. The samples, subjected to a preliminary conditioning over sulfuric acid in desiccators and in the Wilson apparatus, were subsequently conditioned in the latter apparatus for 24 hr. at 70°–80° C. at atmospheres of approximately 15, 30, 40, 65, and 85 percent relative humidity. After the moisture regains under these several conditions, the samples were placed in the experimental tubes, weighed, and placed in the Burton-Pitt instrument, the milliammeter readings being recorded.

Moisture regains appeared to be influenced by the manufacturing processes and were greater for the animal fibers and regenerated cellulose rayons than for cotton materials and linen at each level of humidity. The increases in milliammeter values (in milliamperes) for experimental materials resulting from increasing moisture regain are tabulated, the relationship between the two factors being presented by graph. It was evident that 1 percent differences in regain were associated with increasingly larger capacitances, in general in the following order: Animal fibers, rayon, boiled-out cotton fiber and cotton fabrics, raw cotton fiber, and linen. The milliammeter readings appeared to vary with fiber composition, the capacitance of linen and cotton being higher on the whole than that of rayons and animal fibers; values for silk and wool were lower than those for rayons. The results for cotton at different stages of manufacture were not uniform, raw cotton having a higher capacitance than boiled-out fiber, and bleached cottons having still higher values than the raw, whereas the mercerized cottons appeared to have a lower capacitance at regains above 6 percent. For the most part the washing out of finishing materials did not markedly change the milliammeter values. The capacitance of textile materials appeared to be influenced by moisture regain, fiber composition, stage of manufacture, and presence of finishing materials in addition to certain other variables of the determination itself.

The use of capacitance measurements as a means of determining moisture content would, therefore, appear to require the control of all but one of these variables. The type of apparatus is also important, since the device used in this study was limited in sensitivity to changes of about ±0.50 percent moisture regain.

**Physical and chemical changes produced in bleached cotton duck by Chaetomium globosum and Spirochaeta cytophaga**, R. E. Rogers, H. G. Wheeler, and H. Humfeld (*U. S. Dept. Agr., Tech. Bul. 726 (1940), pp. 35, pls. 2, figs. 13*).—This publication is summarized by the authors as follows:

"A bleached, desized cotton duck was sterilized, inoculated with *C. globosum* and with *S. cytophaga*, two distinct types of cellulose-decomposing organisms, and then incubated on a mineral salts agar. Samples of the fabric were removed at various intervals of time up to and including 15 days for the fungus and 18 days for the bacterium, and then tested physically and chemically. Both types of organisms caused a decrease in warp- and filling-breaking strengths, in weight, and in the thickness of the fabric. Staple-length determinations further indicated that the strength was rapidly destroyed, and that even with extreme care during preparation of the samples considerable breakage of the fibers resulted. There was no significant difference in loss of weight when the carbon dioxide produced was removed as it was formed and when it was allowed to accumulate.

"The penetration of the hyphae into the fibers was shown by a differential staining method developed during this investigation. Fluidity, methylene blue absorption, moisture content, and ash content increased during incubation. Copper numbers of the fabric treated with *C. globosum* became progressively greater, while that of the material incubated with *S. cytophaga* at first decreased and then increased. The large increase in ash content indicates an increased absorptive capacity for mineral salts.

"A method for estimating the evolution of carbon dioxide was modified in such a way as to make it applicable to fabrics. This method, which was used to measure the rate of growth of the organisms, showed a period of decreased carbon dioxide evolution for *C. globosum* during perithecium and spore formation. A sharp break in the rate of carbon dioxide evolution for *S. cytophaga* after the sixth day may be attributed either to the formation of alkaline decomposition products or to the utilization of more acid than basic radicals from the agar medium.

"Under the conditions of the experiment *C. globosum* deteriorated the fabric more rapidly and more completely than did *S. cytophaga*. During incubation with *S. cytophaga* the pH value of the agar changed from 6.8 to 8.4, while that of the agar on which *C. globosum* had grown remained at approximately 6.8. This change in pH value is suggested as a limiting factor in the growth of *S. cytophaga*.

"In a study of the mathematical relationships of the data it was found that logistic growth curves fitted all the breaking strength values as well as the copper number results from *C. globosum*. Second and third degree polynomial equations were found for weight, thickness, fluidity, methylene blue absorption, ash, and moisture."

## HOME MANAGEMENT AND EQUIPMENT

**A study of three methods of research in home management,** I. H. Gross, A. Aikin, T. Tordt, E. A. Zwemer, and W. D. Baten (*Michigan Sta. Tech. Bul. 171 (1940), pp. 19*).—This study was undertaken preparatory to an investigation of home-management practices. Contacts were made through extension workers with 50 rural women, from whom a total of 41 complete reports was obtained concerning their home management practices according to three different methods—interview, questionnaire, and diary for 1 week. From these a group of 4 typical cases in which the three methods were used in turn formed the basis for detailed study. Calculated in percentages of possible questions answered, the interview with 81.1 percent of the relevant questions answered ranked first, followed by the questionnaire with 67.7 percent, and the diary with 20.6 percent. Within each method the responses varied for the four phases studied, money management answers ranking highest and use of time and income lowest by the interview method, use of goods and services highest and use of time and energy lowest by the questionnaire method, and money management and use of goods and services lowest by the diary method.

For the study of the entire 41 sets of responses, the items under the four phases were reduced to a total of 21 key questions and the answers to these classified and compared. The interview and questionnaire methods were found to be significantly better than the diary method in terms of percentages of response for the items completeness, clarity, and vividness with one exception (the keeping of food). Differences in the means showed that the interview and questionnaire surpassed the diary in the quantity of information and clarity of response, but the diary surpassed the other methods in the average number of highly vivid answers. No significant differences were found in the consistency of the replies to corresponding questions between and within methods or in the effect of relative order of use of the three methods.

"From these analyses, the conclusion may be drawn that the interview was the best method for obtaining information concerning home management practices from a selected group of rural women and that the questionnaire succeeded second best. The diary fell greatly below the other two methods except in the

vividness of its answers. A score giving the desirability of one method compared with the other two combined yielded a weight of 27 for the interview, 16 for the questionnaire, and 9 for the diary."

**[Household equipment studies by the Maine Station]** (*Maine Sta. Bul. 397 (1939), pp. 777-779*).—This progress report by M. M. Monroe and P. S. Greene deals with the effect of the method of heat application and accompanying oven conditions upon the flavor and texture of baked foods and a study of the performance of wood ranges heated by distillate burners and an evaluation of factors which affect this performance.

**Some considerations in the selection of fabricated equipment for the institution kitchen,** K. W. Harris. (Cornell Univ.). (*Jour. Amer. Dietet. Assoc., 15 (1939), No. 9, pp. 749-755*).—Practical advice on the selection of equipment for the institution kitchen is given as to the preparation of specifications and the selection of construction materials, with general and specific suggestions relating to questions of construction details and design.

## MISCELLANEOUS

**International directory of agricultural press** (*Repertoire international de la presse agricole. Roma: Fed. Internatl. Tech. Agron., 1939, pp. 419*).—This consists mainly of a classified and annotated directory of 4,091 agricultural publications distributed over 74 countries.

**Popularizing research findings in home economics—the point of view of an administrator of research,** A. B. Conner (*Jour. Home Econ., 32 (1940), No. 1, pp. 1-3*).—An address by the director of the Texas Experiment Station, presented at the 1939 meeting of the American Home Economics Association.

**Principles of the mathematical theory of correlation,** A. A. Tschuprow, trans. by M. Kantorowitsch (*London: William Hodge & Co.; New York: Nordemann Pub. Co., 1939, pp. X+194*).—A presentation of the logical foundation for the theory of correlation based on a compilation of lectures delivered to an actuarial seminar at the University of Oslo, Norway.

**Report of progress [of Maine Station] for year ending June 30, 1939,** [F. Griffee et al.] (*Maine Sta. Bul. 397 (1939), pp. [9]+695-846, figs. 14*).—This contains data noted for the most part elsewhere in this issue or previously.

**Forty-sixth Annual Report [of Minnesota Station],** W. C. Coffey (*Minnesota Sta. Rpt. 1939, pp. 100*).—In addition to articles noted previously or referred to elsewhere in this issue, an abstract is given of the following: Some Researches in Education at the University of Minnesota, by H. K. Wilson (pp. 48, 49).

**What's new in farm science: Annual report of the director, [Wisconsin Station, 1939], II,** compiled by N. Clark and N. Hoveland (*Wisconsin Sta. Bul. 449 (1940), pp. [2]+96, figs. 29*).—This supplements and completes the report previously noted (E. S. R., 83, p. 143) dealing with the subjects of soils; plant diseases; garden, orchard, and cash crops; insect pests and beekeeping; field crops; poultry; and livestock feeding. The experimental work not previously reported is for the most part noted elsewhere in this issue.

**Farm and Home Science, [March 1940]** (*Farm and Home Sci. [Utah Sta.], 1 (1940), No. 1, pp. 12, figs. 9*).—In addition to articles noted elsewhere in this issue and miscellaneous notes, this number contains Too Early Grazing Injures Range Vegetation, by L. A. Stoddart (pp. 7, 11), and Physics Laboratory Aids in the Solution of Soil and Water Conservation Problems, by W. Gardner (p. 12).

# NOTES

**Connecticut University and Storrs Station.**—At its meeting on February 21 the Board of Trustees approved a plan for the administrative reorganization of the university, which in part resulted in the establishment of a College of Agriculture, with Dr. Roger B. Corbett as dean of the college and director of the station and W. L. Slate as vice director of the station. Dr. Corbett, however, has since resigned to become director of the Maryland Station on September 1.

**Florida University and Station.**—Dr. Everett L. Fouts, associate professor of the Oklahoma College and associate in dairy manufacturing in the Oklahoma Station, has been appointed professor of dairy manufacturing and dairy technologist, effective August 1, vice Dr. Lloyd M. Thurston, who died on February 29.

**Georgia University and Station.**—Dr. Earl F. Savage has been appointed assistant horticulturist in the station, effective June 15, vice Dr. F. F. Cowart, associate horticulturist, who is now with the Florida Citrus Substation.

The station is using the radio as a means of acquainting the public with solutions of agricultural problems worked out at that institution. In April 1939, the Board of Regents of the university, of which the station is a unit, inaugurated a series of weekly Forward Georgia radio programs over the Atlanta Station WSB in an effort to present information that would be helpful in the State's further development along agricultural, industrial, and educational lines. Since January, five staff members of the station have appeared on this program to explain results obtained in the following research projects: Pasture development, vegetable pests in Georgia, sweetpotatoes, control of cotton diseases in Georgia, and peaches—recommended varieties and preservation by freezing. Recently the station was also scheduled for a monthly program in a series of daily early morning farm programs.

**Purdue University and Indiana Station.**—Dr. J. Holmes Martin, director of the U. S. D. A. Regional Poultry Research Laboratory, East Lansing, Mich., has been appointed head of the poultry department, effective July 1, vice C. W. Carrick, who, at his own request, has been relieved of administrative work so that he may give full time to research and extension.

Dr. E. R. Martell, assistant dean of the School of Forestry at the University of Idaho, has been appointed head of the department of forestry and conservation, effective August 20, succeeding B. N. Prentice, who will devote more time to instruction.

Dr. Catherine E. Michael, technician in veterinary science, has resigned, effective August 1.

Contracts have recently been let for the construction of two additions to existing structures, with approximate costs of $21,000 and $137,000, respectively. One is a range for the horticultural greenhouses, the dimensions of which are 217 by 36 ft., with a connecting passageway to the other ranges, 20 by 17 ft. The other is an addition, 140 by 165 ft., to the agricultural engineering building. At the front this addition will consist of three stories and an attic, while at the rear it will consist of one story.

**Kentucky University and Station.**—Dean and Director Thomas P. Cooper has been appointed acting president of the university, succeeding Dr. Frank L.

McVey, who retired July 1. Howell D. Spears, senior chemist in feed and fertilizer control, died May 4. E. Bradley Offutt, assistant chemist, has resigned. Recent appointments include Clinton W. Woodmansee, assistant chemist in tobacco investigations; Karl E. Rapp, Jr., assistant chemist; and Donald W. MacLaury, assistant in poultry and genetics.

**Pennsylvania College and Station.**—Dr. F. F. Lininger, head of the department of agricultural economics, has been appointed vice dean of the School of Agriculture and vice director of the station, effective July 1. Dr. M. A. Farrell, associate professor of bacteriology, has been named professor of bacteriology and head of the new department of bacteriology. Other appointments include W. E. Ackerman as assistant in agricultural engineering and B. D. Gleissner as instructor in economic entomology, effective July 1, and Howard R. Cottam as assistant professor of rural sociology, Ellsworth C. Dunkle as instructor in soils, and Emily T. Wolff as assistant in botany, effective September 1.

The resignations are noted of J. R. Culbert, assistant in floriculture, effective September 9, and C. A. Knight, Jr., and W. L. Porter, assistants in agricultural and biological chemistry, Dr. E. L. Nixon, professor of plant pathology, and Fred B. Spyker, assistant in rural sociology, effective June 30.

**Puerto Rico University and College Station.**—According to a note in *Science*, the degree of doctor of science was conferred on Dr. Melville Thurston Cook, head of the department of phytopathology, at the 1940 graduating exercises of the College of Agriculture and Mechanic Arts of the university in recognition of his work in tropical plant pathology.

**Puerto Rico Federal Station.**—Following service as agricultural adviser to the Government of Haiti, Director Atherton Lee was tendered decoration by the President of Haiti as an officer in the Legion of Honor and Merit of that country. Since his service in Haiti, Mr. Lee has served as agricultural adviser to the Government of Ecuador and in a similar capacity to the Government of Colombia.

**Rhode Island College and Station.**—Notice has recently been received of the death on December 6, 1939, in South Attleboro, Mass., of Charles Otis Flagg, first president of the board of managers of the college and director of the station from 1888 to 1897. Director Flagg was born in Westminster, Mass., in 1851, and was graduated from the Massachusetts College in 1872. Most of his life was spent in farming in Alabama, New Jersey, Massachusetts, and Rhode Island.

**Washington College and Station.**—On June 1, ceremonies were held in dedication of a granite block and bronze tablet to the memory of Dr. William J. Spillman (E. S. R., 65, p. 601). This memorial marks the site of his experimental plats, where, at his request, his ashes were placed and later those of his wife, Mattie Ramsay Spillman. A bronze tablet to their memory is also being placed in the agricultural building. At the dedicatory exercises tributes to Dr. Spillman were delivered by President E. O. Holland and Dean and Director Edward C. Johnson.

**Office of Experiment Stations.**—Dr. Floyd Andre, associate entomologist in the U. S. D. A. Bureau of Entomology and Plant Quarantine, has been appointed entomologist, effective June 15.

Mary A. Agnew, senior clerk, associated with the Office since 1902, died June 3 at the age of 69 years. In recent years her services had been mainly in the preparation of the list of Workers in Subjects Pertaining to Agriculture in Land-Grant Colleges and Experiment Stations. Miss Agnew's retirement was to have become effective June 30.

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# EXPERIMENT STATION RECORD

VOL. 83 OCTOBER 1940 No. 4

## EXPERIMENT STATION RESEARCH IN VETERINARY MEDICINE

The 1940 convention of the American Veterinary Medical Association, held from August 26 to 30, was the first to meet in the National Capital since 1891. At that time the organization was 28 years old, but veterinary medicine was still far from complete acceptance as a profession and research in this field was in its infancy. The experiment stations organized under the Hatch Act had had only a few months of actual operation, and while the organization list issued in June 1892 revealed veterinarians on the staffs in 21 States and consulting veterinarians in 2 others, advisory, regulatory, and instruction duties largely occupied their time in most cases. Volume 3 of *Experiment Station Record*, covering the entire year ended August 1, 1892, contained but 24 abstracts under the heading veterinary science and practice, and of these only 14 reported investigations. Nevertheless, some fundamental research was under way, and as a recent editorial in the *Journal of the American Veterinary Medical Association* recalls, the year 1891 "will live through the ages in our circle as the historic date when the research laboratories of the Federal veterinary service incriminated insects [ticks] as the carriers ( . . . ) of microbic infections and thereby laid bare the broad field of investigation that has revolutionized etiology and preventive medicine, and specifically, in animal production, opened the way for the development of large-scale cattle breeding in the Southern States." Nor should it be forgotten that the Arkansas Experiment Station had carried on tests confirmatory of these results, and that it was in the campaign against the cattle tick that the veterinarians of the Texas and Missouri Stations, by their formal agreement in 1888 for mutual assistance, had shown the way to interstation cooperation.

Many factors have contributed to the progress of the half century, but prominent among them has been the development of the association itself. In 1891 its paid-up membership was less than 200, and the total attendance at the first Washington meeting was about 75. The present membership is over 6,000, and the convention at-

tendance was estimated at 1,500. The circulation of the *Journal* has grown to 7,000, and its columns have become congested with research articles submitted for publication. One of the constructive accomplishments of the convention was its provision of a wider outlet by supplementing the *Journal* with the *American Journal of Veterinary Research*. It is announced that this publication will appear quarterly, or oftener if necessary, as "a medium for the prompt publication of the original researches and investigations of American veterinarians and their associates." The prospectus of the initial number lists 13 articles, of which 6 are contributions from experiment station staff members.

Some idea as to the increase in the research output since 1892 may be afforded by the statement that the total number of abstracts in the section of veterinary medicine in volumes 81 and 82 of the *Record* (fiscal year 1940) was 706. Most of these abstracts reported results of research. Although the field was covered as broadly as space permitted, nearly 200 of the articles were indicated as contributions of station staffs, and a considerable number accredited to the land-grant colleges and universities or without institutional identification were financed in whole or in part by station funds.

This is a generous representation, but probably not out of proportion to the amount of veterinary research under way. Data recently compiled by the Office of Experiment Stations show that the total number of station projects in veterinary medicine now active and supported by Adams, Purnell, and Bankhead-Jones funds is 135, and that the Federal fund allotments for these projects total $252,950. Of these, 45 projects and $67,502 are under the Adams Act, 44 and $94,620 under the Purnell Act, and 46 and $90,828 under the Bankhead-Jones Act. Grouped by subjects, 41 deal with cattle diseases, 32 with poultry diseases, 29 with parasites, and 12, 9, and 8 with the diseases of swine, sheep, and horses, respectively. In addition, of course, are many projects financed under the Hatch Act, by State funds, regulatory fees, and in other ways.

The latest list of workers in the experiment stations, issued under date of April 1940, shows nearly 200 enrolled in departments of veterinary medicine, animal pathology, or in comparable positions. Of these, nearly half are reported as full-time station employees. In addition, the complexity of modern research makes imperative in many cases the enlistment of the services of nonveterinarians, notably bacteriologists, chemists, and specialists in animal breeding and nutrition. If these could be included in the enumeration, it seems certain that the effective manpower available in the stations would be found to be at least 10 times that of 50 years ago.

Under these circumstances it would be expected that the stations would be liberally represented in the association program. This was the case, particularly in its section on research. This section held two sessions, at which special attention was given to mastitis and Bang's disease or brucellosis. Other papers dealt with equine encephalomyelitis, nonspecific hemoglobinuria and acute pulmonary emphysema of cattle as essential enterotoxemias, the pathology of the bovine kidney in vitamin A deficiency, studies on *Thysanosoma actinioides*, determination of parentage in cattle by means of cellular antigens in the blood, and sulfapyridine in cattle. Of the 15 papers listed for the section, 8 were contributions by members of station staffs.

Research papers were also numerous in other sections, especially those on poultry, sanitary science and food hygiene, and general practice, as well as in the general sessions. In these programs the participants from the stations numbered about 20. Among their subjects were brucellosis, diseases of swine due to nutritive deficiencies, hog cholera, further investigations of rumen gases and bloat in ruminants, ophthalmology in Equidae, the bacterial content of goat milk, the control of liver flukes of cattle in the Hawaiian Islands, parathyroid studies in turkeys, carriers of *Hexamita meleagridis*, swine erysipelas in turkeys, transmission experiments with iritis of fowls, the pathology of so-called pullet diseases or blue comb, the nutritional deficiency diseases of chickens, and a comparative study of pullorum disease in Barred Plymouth Rocks and New Hampshire Reds. There were also two papers from the recently established National Poultry Research Laboratory at East Lansing, Mich., one dealing with inheritance as a factor in poultry pathology research and the other with findings in fowl paralysis.

Still another point of contact with the stations at the convention was the awarding of the Twelfth International Veterinary Congress Prize for noteworthy contributions to research. This honor was bestowed upon Dr. I. Forest Huddleston, research professor of bacteriology in the Michigan Station, primarily for his work on brucellosis. An address by Dr. Huddleston reviewing 25 years' progress was among the relatively few papers given in the general sessions.

The Washington meeting demonstrated anew the substantial progress in veterinary medicine during the past half century and the large share which research has played in this development. In this research, as the convention clearly indicated, the experiment stations have had and are having a notable share and influence.

# RECENT WORK IN AGRICULTURAL SCIENCE

## AGRICULTURAL AND BIOLOGICAL CHEMISTRY

**[Chemical work at the Kentucky Station]** (*Kentucky Sta. Rpt. 1939, pt. 1, pp. 32, 33*).—The station reports work on a method for determining fluorine (coop. Tenn. Expt. Sta.), failure to establish a fluorine deficiency in a rat diet, determinations of fluorine in rat and horse bones, spectrographic determinations of some of the trace-requirement elements, work on a colorimetric method for determining boron in some plant materials, and tobacco analyses.

**[Chemical work of the Tennessee Station]** (*Tennessee Sta. Rpt. 1938, pp. 43–48, 49–52, figs. 3*).—This has included work on legume silage, processing of cottonseed and cottonseed products, sorgo sirup, and utilization of fruits, all by G. A. Shuey; and the chemical composition of certain crops, by E. K. Weathers.

**Attendance at 1940 pickle school breaks record,** F. W. Fabian (*Canning Age, 21 (1940), No. 4, pp. 180–182, figs. 3*).—Abstracts of the following papers presented are of interest: The Incidence of Yeasts in Cucumber Fermentations, by J. L. Etchells, and [Bacteriological] Methods of Examination of Fresh Cucumber Pickle, by J. L. Etchells and H. E. Gorsline (both U. S. D. A.); A New Method for the Prevention of Scum-Forming Microorganisms, by F. W. Fabian (Mich. State Col.); Observations on the Influence of the Addition of Sugar to Brines in Cucumber Fermentations, by M. K. Vedhuis, J. L. Etchells, I. D. Jones, and O. Veerhoff (U. S. D. A. and Univ. N. C.); and The Bacteriology of Cabbage and Sauerkraut, by C. S. Pederson (N. Y. State Expt. Sta.).

**Report of the 1937–38 committee on methods of analysis,** R. M. Sandstedt. (Univ. Nebr.). (*Cereal Chem., 15 (1938), No. 6, pp. 812, 813*).—This is a very brief statement of collaborative work.

**Hydrogen peroxide in the colorimetric determination of iron by thiocyanate,** C. A. Peters, M. M. MacMasters, and C. L. French. (Mass. State Col). (*Indus. and Engin. Chem., Analyt. Ed., 11 (1939), No. 9, pp. 502, 503, figs. 1*).—The use of hydrogen peroxide as an oxidizing agent in place of permanganate in colorimetric iron determinations by the thiocyanate method is reported to have given success in many hundreds of iron determinations over a period of several years. The hydrogen peroxide is considered the more satisfactory of the two oxidants, since the red color can be made stable for several minutes, depending on the amount of peroxide used, and since the color may be restored if necessary by the addition of more peroxide. Curves showing the rate of fading of the thiocyanate, with and without hydrogen peroxide, indicate the stabilizing effect of the peroxide. The color is stable for at least 5 min. in the presence of 0.0028 M peroxide. Since the ordinary thiocyanate reagent contains traces of iron as an impurity, tests were made to find out how much hydrogen peroxide could be used safely without giving any color with the reagent itself. Too much peroxide, 0.18 M or above, was found to produce a yellowish interfering color. This did not develop with lower concentrations of peroxide and

thiocyanate if the acid concentrations were kept below 0.1 N. Acid, peroxide, and thiocyanate at respective concentrations of 0.01 N, 0.0024 M, and 0.3 N gave satisfactory results.

**Isolation of nitrogenous compounds from the mold Aspergillus sydowi,** D. W. WOOLLEY and W. H. PETERSON. (Univ. Wis.). (*Jour. Biol. Chem., 119 (1937), No. 1, p. CVII*).—This abstract summarizes a part of the work of a series of investigations already noted (E. S. R., 82, p. 9).

**A method for the quantitative spectrochemical analysis of very small amounts of biological materials for sodium, potassium, calcium, magnesium, and lead,** O. S. DUFFENDACK, K. B. THOMSON, W. C. LEE, and O. G. KOPPIUS (*Jour. Biol. Chem., 126 (1938), No. 1, pp. 1–7*).—The essential feature of the method described consists in the use of a high voltage, low current alternating current arc with some peculiar properties. A potential difference of 1,100 or 2,200 v. and a current of about 2.2 a. were found satisfactory. The power is supplied by a 5-kv.-a. step-up transformer such as is used in city-service distribution. The impedance for controlling the current is put in the secondary circuit in series with the arc and may consist of choke coils with a resistance of 100 ohms at 60 cycles. Marked changes can be produced in the behavior of the arc and in the relative intensities of the spectral lines by varying the inductance. With the choke coils described, a steady arc can be maintained at 1,100 v. across a gap of 2.5 mm. as long as there is salt on the electrodes. The arc will not maintain itself on clean carbons or on carbons coated with salts not containing a sufficient amount of the alkali metals. The arc does not develop nearly as much heat at the electrodes as does an ordinary direct current arc. After several minutes' operation, the electrodes show no signs of redness, and as a result of this low temperature the salt remains on the carbons throughout the exposure.

**The role of the spectrograph in the analysis of agricultural materials,** S. S. BALLARD (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *44 (1940), No. 1, pp. 35–48, figs. 7*).—The author points out some advantages and disadvantages of spectrographic analysis, noting especially that the average error is about 2 percent and is constant with respect to percentage, whereas in chemical analysis the error is constant not in percentage but in absolute quantity. This usually gives the advantage in point of accuracy to chemical methods if the substance to be determined is present to the extent of about 1 percent or more, but when from 0.1 percent to thousandths of 1 percent of the element to be determined is present, a greater accuracy may be expected from the spectrograph. Experimental technic and some examples of work with agricultural materials are discussed.

**The ultra-violet absorption of calciferol,** S. K. CREWS and E. L. SMITH (*Analyst. 64 (1939), No. 761, pp. 568–570*).—This study was undertaken collaboratively to find the reason for discrepancies in the figures for ultraviolet absorption as determined in two different laboratories. Of the three instruments used, two were fitted with Spekker photometers and the third with a modern short-focus rotating sector photometer. In all experiments the light source used was a condensed spark between tungsten steel electrodes. It was found that different samples of calciferol all gave appreciably lower values for $E^{1\%}_{1cm.}$ 265 mμ when examined with the rotating sector instrument than with the others. In this instrument the time of exposure of the calciferol to irradiation was much longer than in instruments equipped with Spekker photometers. This photolability of calciferol was further evidenced by the increasingly lower values obtained with the same calciferol solution used in successive determinations. It was also established that the rate of photo-

chemical change was about the same in isopropyl alcohol as in cyclohexane solution. Determinations made with a special cell arranged so that the solution flowed through it during the spectrophotometric determination gave slightly higher values than the normal technic. It is considered that this continuous-flow method offers the most accurate means of determining the extinction coefficient of calciferol and other substances whose absorption spectrum is affected by exposure to ultraviolet irradiation.

**A mechanically operated continuous liquid-extraction apparatus,** G. W. PUCHER and H. B. VICKERY. (Conn. [New Haven] Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 11 (1939), No. 12, pp. 656, 657*).—A modified Widmark extraction apparatus is constructed from two Erlenmeyer flasks connected side by side with a short length of wide-bore tubing sealed into the sloping walls of the flasks. The apparatus is rocked through an angle of ±15° around an axis placed beneath the horizontal connecting tube. A plant extract acidified to pH 1.0 is placed in one flask and 0.5 N sodium bicarbonate in the other; ethyl acetate is then added to the level of the connecting tube. As the solvent flows back and forth during oscillation, the organic acids are gradually collected in the alkali. The apparatus may be used in small sizes for quantitative analytical extractions and in larger sizes for preparation work. It can be applied equally well for the extraction of such basic substances as nicotine.

**Partition of the less easily digested carbohydrate complex of forages,** R. E. DAVIS and C. O. MILLER. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed., 11 (1939), No. 12, pp. 651, 652*).—The method described is a combination of enzymatic and chemical procedures and involves several modifications of earlier methods. Preliminary extraction of the sample with dry ether before treatment with enzymes was found to aid in obtaining more uniform enzymatic action, especially with grasses. It was also found necessary to autoclave the samples before adding the enzymes to prevent the growth of molds. Enzymatic digestion was the most effective treatment for removing nitrogen from the grass. In subsequent work it was adopted for preliminary treatment of the sample. Earlier methods were modified by using a smaller volume and reducing the quantity of pepsin and trypsin. The quantity of pepsin and trypsin was found to have no pronounced effect on the amount of nitrogen removed from the sample if more than 50 mg. per gram of sample were present. The trypsin extract should be filtered before use to prevent any undissolved material from increasing the weight of the residue. Tests on fineness of grinding of the grass showed best results when the entire sample passed through a 0.5-mm. screen. In the determination of lignin, the concentration of the acid proved to be an important factor. The results showed that for grasses the concentration must be above 65 percent by weight. Below this the results are too high. In order to adapt the method to a routine procedure that would handle a large number of samples, it was desirable to eliminate the long reaction time at low temperatures. The method was modified so that the reaction could be carried out at room temperature.

**Determination of chlorophyll and carotene in plant tissue,** H. G. PETERING, W. WOLMAN, and R. P. HIBBARD. (Mich. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 12 (1940), No. 3, pp. 148–151, figs. 2; abs. in Michigan Sta. Quart. Bul., 22 (1940), No. 4, p. 294*).—The pigments are extracted by grinding the tissue with sand and acetone. The extract is then made up to a known volume, and an aliquot is placed in the absorption cell of the photoelectric colorimeter for chlorophyll determination. A Corning No. 243 H. R. polished glass filter is used in combination with a Corning No. 396 H. R. filter to isolate a band of red light which is strongly absorbed by chlorophyll. Comparison

of the colorimeter reading with a standard curve yields chlorophyll values directly. The yellow plant pigments do not interfere with this determination.

An aliquot of the extract is refluxed with excess of finely divided barium hydroxide octahydrate, which removes chlorophyll. The mixture is cooled, filtered, and washed. The filtrate is then transferred to a separatory funnel, extracted with petroleum ether, and the petroleum ether phase is washed free of other solvents and xanthophylls. The carotene in the petroleum ether is then determined photometrically. A Corning polished glass filter No. 554 H. R. is used to isolate a spectral band which is strongly absorbed by carotene. A method for correcting for any traces of chlorophyll which may interfere with the carotene determinations is outlined.

**The effect of sweet potato carbohydrates on the determination of carotene** (*South Carolina Sta. Rpt. 1939, p. 84*).—Inapplicability of standard methods is reported upon by J. H. Mitchell and E. J. Lease.

**Comparative mineral composition of [turnip greens] grown under various environmental conditions,** J. H. MITCHELL, E. J. LEASE, and J. B. EDMOND (*South Carolina Sta. Rpt. 1939, pp. 80, 81*).—Analyses of Seven Top turnip greens grown at Clemson and at the Edisto and Sandhill Substations in the fall of 1938 and the spring of 1939 are tabulated.

**[Cider preservation experiments at the Ohio Station]** (*Ohio Sta. Bul. 600 (1939), pp. 40, 41*).—Preservation of cider free from spoilage organisms for 3 mo. under 100–125 lb. pressure of carbon dioxide is reported, together with preservation by freezing concentration and carbonation to 3½ volumes.

**The cocarboxylase content of human blood** [trans. title], F. WIDENBAUER (*Klin. Wchnschr., 18 (1939), No. 43, pp. 1392–1394*).—Ritsert's conclusion that cocarboxylase is absent from human blood is questioned. It is considered that his method (E. S. R., 82, p. 298) would fail to detect thiamin present as cocarboxylase, partly because of the great dilution effected and partly because the sodium sulfate deproteinization would precipitate any unsplit cocarboxylase-protein complexes.

In the procedure here presented such complexes are broken down by hydrolysis as a preliminary step, 1 cc. of serum and 5 cc. of water, made acid to Congo red with HCl, being heated for 5 min. on a boiling water bath. The protein, precipitated with 1 cc. of 20 percent trichloroacetic acid, is separated by centrifuging, and the supernatant liquid withdrawn and made up to 6 cc. Half of this amount, taken for the main test, is treated with 2 cc. of 30 percent NaOH and 0.1 cc. of 1 percent $K_3Fe(CN)_6$, the color from the excess of reagent being dispelled after 2 min. by the addition of a few drops of $H_2O_2$, and the mixture upon cooling being treated with 3 cc. of HCl (a 2.5-fold dilution of concentrated HCl). The thiochrome content of the resulting fluorescent solution is determined by titrating the blank (the other 3 cc. of the clarified serum) under a quartz lamp to a similar degree of fluorescence (as noted by the naked eye) with a standard water solution of thiochrome prepared by the Ritsert method and containing thiochrome equivalent to 0.0645$\gamma$ of vitamin $B_1$ per 0.01 cc.

The results give the total vitamin $B_1$ (aneurin plus cocarboxylase) content in 0.5 cc. of serum expressed as aneurin hydrochloride. The proportion of the two components may be determined by determining aneurin only, by the Ritsert method applied to serum, or by extracting the fluorescent test solution with isobutanol which removes the thiochrome from the aneurin and leaves the diphosphothiochrome from the cocarboxylase in the water solution. This latter portion, now of lower fluorescence than the blank, is titrated up to the fluorencent strength of the blank with a standard isobutanol thiochrome solu-

tion. The added thiochrome × 1.4 gives a measure of the cocarboxylase content.

No protocols are presented, but the method outlined is said to give 100 percent recovery of aneurin and of cocarboxylase added to rat serum (from $B_1$-deficient rats) containing less than 1γ percent of vitamin $B_1$. Human serum was found to have on an average a total vitamin $B_1$ content of 15γ percent, the cocarboxylase portion averaging 5γ percent.

**A simple method for quantitative determination of cocarboxylase in blood and tissues by the thiochrome procedure** [trans. title], K. RITSERT (*Klin. Wchnschr., 18 (1939), No. 42, pp. 1370–1372*).—The method, based in part upon procedures (discussed) that have been previously described, permits the determination of cocarboxylase in 1 cc. of blood or in small amounts of tissue. The present method introduces the use of diastase to liberate the aneurin from its pyrophosphoric acid ester (cocarboxylase), thus permitting the application of the thiochrome test without preliminary purification by adsorption. In the procedure as outlined 1 cc. of blood is hemolyzed with 4 cc. of water and the mixture poured into 20 cc. of methanol to precipitate the hemoglobin, which is removed by centrifugation and washed once with 10–20 cc. of 80 percent methanol. The supernatant liquid and the washings, slightly acidified and freed of methanol by vacuum distillation, is diluted to 20 cc., acidified with HCl to pH 4.5–5, treated with 0.5 gm. of diastase (Merck), and permitted to stand for 4 hr. at 37° C. The protein is precipitated from the mixture (after transfer to a beaker with 10 cc. of water and heating to 90°) by the addition of 0.5 cc. of 25 percent HCl and 12 gm. of anhydrous sodium sulfate, followed by 3 min. of heating and stirring at 90°, and subsequently filtered off with suction, 5 cc. of hot saturated sodium sulfate being used for washing. The clear filtrate is then treated directly with 30 cc. of 15 percent NaOH and oxidized with 2.5–5 cc. of 1 percent $K_3Fe(CN)_6$, enough of the reagent being used to impart a faint permanent yellowish tinge. After 2 min. this solution is extracted with isobutyl alcohol, the extract dried with anhydrous sodium sulfate, and compared under a quartz lamp with a standard thiochrome solution.

Analyses reported for eight samples of human blood show values of 3γ–11γ percent for free aneurin, with corresponding values from 7γ to 18γ percent for bound plus free aneurin. Values are also reported for various rat organs and for human urine; 12γ–15γ of free aneurin were found in the normal urines tested, but cocarboxylase was not present.

**The phosphatase test for control of efficiency of pasteurization**, H. D. KAY, R. ASCHAFFENBURG, and F. K. NEAVE (*Imp. Bur. Dairy Sci.* [*Shinfield*], *Tech. Commun. 1 (1939), pp. 53, figs. 8*).—A comprehensive critical review, with 85 references to the literature.

**A standard Wohlgemuth procedure for alpha-amylase activity**, R. M. SANDSTEDT, E. KNEEN, and M. J. BLISH. (Nebr. Expt. Sta.). (*Cereal Chem., 16 (1939), No. 6, pp. 712–723, figs. 2*).—It was found that increasing the ratio of β-amylase to α-amylase in the starch-enzyme mixture increases the rate of dextrinization up to a point beyond which further increments of β-amylase have essentially no effect. The basis of a standardized technic for the quantitative measurement of α-amylase involves the addition of sufficient supplementary β-amylase to eliminate the variable effect of β-amylase already present in the malt extract. The preparation and use of an easily reproducible red-brown dextrin-iodine solution as a standard end point is described. The linear relationship between α-amylase content and dextrinization time permits calculation of α-amylase units as the number of grams of soluble starch which, under the influence of an excess of β-amylase, are dextrinized by 1 gm. of malt in 1 hr. at 30° C.

Application of the method to barley malts is discussed, and the lack of parallelism between α-amylase activity and either saccharogenic or dextrinogenic activity of malts is demonstrated.

**The relation of alpha- and beta-amylases to the evaluation of malts in flour technology,** R. M. Sandstedt. (Univ. Nebr.). (*Cereal Chem., 15 (1938), No. 6, pp. 832–835*).—The author finds that the method of evaluating malts by a pressure-meter method (E. S. R., 73, p. 743) promises to be reliable and useful. α-Amylase is the amylase of predominant importance in malts which are used as flour supplements. Because of the universally high β-amylase content of flours themselves, the β-amylase content of a malt is of no consequence. Accordingly the Lintner value may not correspond to the true value for baking purposes.

**The proteinase in wheat flour,** W. S. Hale. (U. S. D. A.). (*Cereal Chem., 16 (1939), No. 5, pp. 695–702, fig. 1*).—The author reports that a proteinase was extracted from patent flour but not successfully purified. Examination of its behavior toward oxidizing and reducing agents led to the conclusion that it is an enzyme of the papain type. There is considered to be no reason at present to believe that it is different from the enzyme obtained previously from bran and whole wheat. The flour proteinase was found to be activated by cysteine and inactivated by iodoacetic acid and a variety of bread improvers.

**Measuring fermentation rate and gas losses in dough,** C. H. Bailey. (Minn. Expt. Sta.). (*Cereal Chem., 16 (1939), No. 5, pp. 665–671, figs. 2*).—The author describes a simple and relatively inexpensive device, assembled largely from ordinary laboratory equipment, which makes possible the measurement both of fermentation rate in a yeast-leavened dough and of the loss of $CO_2$ from fermenting doughs. A special copper vessel to hold the dough, heavy, rugged, easy to seal tightly, and a good thermal conductor, is desirable. The device here described is designed for manual operation, but it is possible to add various automatic features. All operations can be conducted at atmospheric pressure.

**Maltose fermentation activators as affecting baking,** R. M. Sandstedt and M. J. Blish. (Nebr. Expt. Sta.). (*Cereal Chem., 15 (1938), No. 6, pp. 788–794, fig. 1*).—Flours adjusted to the same sugar levels in baking showed considerable differences in rate of gas production, especially in the later stages of fermentation. This is attributed to variations in flours with respect to quantity of a specific biocatalyst (activator) that stimulates maltose fermentation. Bakers' yeast is ordinarily highly deficient in its ability to ferment maltose in the absence of the activating factor, which, as yet unidentified, is tentatively designated as "factor M." Variations among different flours with respect to quantity of factor M make it very difficult to control rate of gas production, even though actual sugar levels may be fairly well adjusted to a standard basis. It is, therefore, considered that the safest practical procedure in straight dough baking is to use a liberal quantity of sugar and proof to standard height rather than to standard time.

**Starch in relation to some baking properties of flour,** R. M. Sandstedt, C. E. Jolitz, and M. J. Blish. (Nebr. Expt. Sta.). (*Cereal Chem., 16 (1939), No. 6, pp. 780–792, figs. 12*).—Starch and gluten which have been washed from flour may be recombined to form a dough with baking characteristics similar to those of original flour doughs. Various combinations of starch and gluten fractions, and of various treatments, can be suitably studied by this technic.

The starch from flour may be separated into two fractions by centrifuging. One of the fractions is relatively pure starch, and the other (smaller fraction) contains the dextrins produced by the action of the flour amylases on the readily available starch. This fraction is tentatively designated as amylodextrin. The amylodextrin fraction of the flour is a factor in absorption and determines to a marked extent the handling characteristics of flour doughs.

It is closely associated with stickiness of doughs and with tenderness of crumb in the baked loaf. The improving effect of malt on many flour doughs is due not to its proteolytic action but to the action of α-amylase on the starch. Certain undesirable baking characteristics of some exceedingly hard wheat starches are due to damage to the starch in milling. Some commercial wheat starches seemingly owe their poor baking properties to hypochlorite treatment. The detrimental effect of the hypochlorite may be overcome by treatment with large quantities of malt, the effective agent apparently being its α-amylase component.

***The rapid determination of moisture,*** R. M. SANDSTEDT. (Univ. Nebr.). (*Cereal Chem., 15 (1938), No. 6, pp. 813–815*).—Since it seemed that the air oven is slow because of poor heat transfer to the sample, the author felt that it should be possible to accomplish a very great saving in time by making use of a heavy plate of a rapidly heat-conducting, high-heat-capacity metal, thus depending on the weight and high specific heat of the metal to heat the samples with no appreciable change in temperature of the plate. It also seemed possible to make use of such a metal plate for rapidly cooling the samples for weighing after removal from the oven. Aluminum plates were found to serve both purposes satisfactorily. It was found that 15 min. at 140° C. plate temperature was sufficient for flours and 20 min. sufficed for the coarser grindings.

**Starch as a factor in dough formation,** O. E. STAMBERG. (Minn. Expt. Sta.). (*Cereal Chem., 16 (1939), No. 6, pp. 769–780, figs. 3*).—The surface area per gram of wheat starch based on the average of 17 flours was calculated as 2,004 $cm.^2$ The flours showed a variation in surface area of 88.8–116.7 percent of the average surface area, but 12 of the flours were within a 12 percent range of variation or within 94–106 percent of the average. The starch granules below 7μ in diameter represent 81.6 percent, but in terms of weight or total surface area the granules above 14.8μ in diameter represent 93 percent by weight and 76.4 percent of the total surface area. The surface areas per gram of commercially prepared potato, wheat, corn, and rice starches were found to be 853, 1,907, 3,077, and 8,000 $cm.^2$, respectively, or in approximate ratios of 1, 2, 3, and 8, respectively.

Upon dilution of a flour with the various sizes of starch granules, the absorptions necessary to produce doughs of a minimum mobility of 500 farinograph units at various protein levels were determined. The minima of the resulting absorption curves were at different protein levels when the various starches were used. By calculating the starch surface area per milligram of protein at these minima the values were 19.8, 20.3, 20.1, and 23.3 $cm^2$, for the rice, corn, wheat, and potato starch curves, respectively, with an average value of 20.9. Thus the starch surface area was in this way indicated as the factor involved at the minima of the absorption curves. It was concluded that for dough formation in the farinograph mixer the protein content of a flour must be over 7.5 percent (15 percent moisture), or on a dry basis the ratio of flour protein to starch must be greater than 0.1. It was calculated that the variation in starch surface area in the 17 flours studied can effect a variation in the absorption of as high as 2 percent, but with the majority of the flours this variation would be 1 percent or less. Injured starch granules were observed to increase the absorption appreciably and may be of most importance. Some estimations of the thickness of protein films in doughs were made on the basis of the thickness of monomolecular protein films, and in doughs made from 7.5 percent protein flour, the minimum for dough formation, the protein film was estimated to be several hundred protein molecules thick.

**Particle size in relation to flour characteristics and starch cells of wheat,** L. H. PULKKI (*Cereal Chem., 15 (1938), No. 6, pp. 749–765, figs. 2*).—Semolina and middlings material was reduced to various degrees of fineness to pass through the sieve numbers 60 g. g., 6 xx, 10 xx, 14 xx, and 25 xx. In grinding, elevation of temperature likely to cause chemical changes was avoided.

The medium-fine flour (through 10 xx) showed definitely better baking properties than the coarser and finer products. The coarsest (original) and the finest (through 25 xx) materials gave smaller loaves and the qualities of crust and crumb were inferior, e. g., the color of crumb was grayish.

The reduction of the size of particles increased water absorptions substantially. The periods of dough development (farinographic) were simultaneously lengthened. With increasing degree of fineness great increases in the amylolytic activity (saccharogenesis) were noted. A theory that the starch cells of wheat are surrounded by a film or a thin layer of substance which is easily removable by means of mechanical treatment is supported by experimental evidence. The film is colored blue with iodine, but, unlike the main part of the cell, it is not stainable with Congo red.

**A comparison between the Allis-Chalmers and micro-milling techniques on North Dakota hard red spring wheats,** R. H. HARRIS and T. SANDERSON. (N. Dak. Expt. Sta.). (*Cereal Chem., 16 (1939), No. 5, pp. 619–625*).—An analysis of the data showed no significant differences between the mean values of the two series of flours in respect to protein content, flour yield, and loaf volume. Significant differences in means, however, were shown for flour ash and diastatic activity, the micro-milled flour being highest in each instance. The authors consider it extremely probable that the sharper rolls on the micro-mill, as compared with those of the Allis, affected these flour characteristics. Significant positive correlation between milling methods was demonstrated for flour protein, flour yield, diastatic activity, and loaf volume, although the majority of the coefficients were not sufficiently high to justify predicting one variable from a knowledge of the other. It is thought probable that a wider range in flour strength would increase the correlation between loaf volumes.

**The solubility of some constituents of soybean meal in alcohol-water solutions,** R. H. NAGEL, H. C. BECKER, and R. T. MILNER. (U. S. D. A. et al.). (*Cereal Chem. 15 (1938), No. 6, pp. 766–774, figs. 3*).—The solubility of the nitrogenous constituents of soybean meal in both methanol- and ethanol-water solutions, the denaturing action of ethanol-water solutions upon soybean protein, the solubility of soybean lecithin in ethanol-water solutions and correlation of the quantity extracted with the observed denaturation, and the quantity of sugars extracted from soybean meal by means of ethanol-water solutions have been investigated. It is suggested that the lecithin present in soybean meal is largely responsible for the ease and completeness with which soybean protein disperses into water.

**On "a new color reaction for vitamin $B_1$ (thiamin, aneurin),"** G. E. YOUNGBURG (*Science, 90 (1939), No. 2346, p. 566*).—The blue color described by Villela and Leal (E. S. R., 82, p. 151) as characteristic of the reaction of vitamin $B_1$ with ammonium molybdate in sulfuric acid solution and aminonaphthosulfonic acid solution could not be obtained in the present study employing the vitamin as the neutral base (thiamin chloride hydrochloride treated with NaOH) and using the Fiske and Subbarow method, as suggested by Villela and Leal. The use of stannous chloride as the reducing agent instead of the aminonaphthosulfonic acid likewise gave no blue coloration.

Since both of these reagents are used in phosphorus determinations by the blue color methods, it is assumed from the present experiments that thiamin is not an interfering substance in such phosphorus determinations. It is suggested that the blue color obtained by Villela and Leal was probably due to impurities.

**Ultramicrodetermination of thiamine by the fermentation method,** L. Atkin, A. S. Schultz, and C. N. Frey (*Jour. Biol. Chem., 129 (1939), No. 2, pp. 471–475, figs. 3*).—A method which permits the determination of as little as 0.005 μg. ($5\times10^{-9}$ gm.) of thiamin is described. This method, a modification of the original one (E. S. R., 79, p. 11), employs the conventional Warburg apparatus, except for a flask of special design (described and illustrated by diagram), at 30° C. Details are given as to solutions and procedure. Under the conditions of analysis, which permit of the maximum fermentation rate, 5 μg. of bakers' yeast produce at 30° about 400 mm.$^3$ of gas per hour. In the presence of thiamin the fermentation rate is increased, the relation between stimulation and quantity of thiamin being approximately linear up to 30 mμg. (at which point stimulation is 380 mm.$^3$) and completely linear between 10 and 20 mμg. In the determination, therefore, the gas production due to 10 and 20 mμg. of thiamin is measured as a standard; the production with aliquots of the unknown, containing intermediate quantities of thiamin, is also determined, the quantity of thiamin present being estimated from the standard curve (line) on the basis of a linear relationship.

Tabular data and curves illustrating this method of determination are presented. Rice polish, two samples of dry yeast, and milk (grade B) were found by the ultramicromethod to contain, respectively, 20.8, 904, 66, and 0.40 μg. of thiamin per gram. These results correspond to those obtained with the original fermentation method (which gave values of 22.0, 960, 68, and 0.40, respectively) and hence bear the same relation to rat growth tests (E. S. R., 79, p. 11).

**Determination of lactoflavin (vitamin $B_2$) in natural products** [trans. title], G. Lunde, H. Kringstad, and A. Olsen (*Hoppe-Seyler's Ztschr. Physiol. Chem., 260 (1939), No. 3–4, pp. 141–147*).—Determinations of the lactoflavin in quantitative alcoholic extracts of a number of natural products were carried out by a method involving the conversion of the lactoflavin to lumiflavin, through irradiation, and subsequent measurement of the absorption of the lumiflavin formed. Results by this method, as determined for milk, pork liver, and a number of fish and fish products, were always significantly lower than those obtained by direct measurement of the absorption of lactoflavin itself This latter method involved the adsorption of lactoflavin on Frankonite, elution with a pyridine-methanol-water mixture, and oxidation of the extract with permanganate in acetic acid solution to destroy foreign pigments, the lactoflavin not being attacked. Results by this method could be checked by biological assays in the case of animal products but not in the case of plant material for which the lactoflavin method gave high values. These were attributed to the interfering absorption of pigments which the permanganate failed to destroy. By introducing another step into the procedure to reduce lactoflavin to the colorless dehydro compound, a photometric reading could then be made to determine the absorption of the interfering pigment itself. The difference between the two absorption measurements gave the absorption of lactoflavin. The procedure is reported in detail, and the results are tabulated. A number of determinations on spinach, using the reduction method, gave values ranging from 335γ to 370γ per 100 gm.; values of 440γ, 320γ,

and 180γ per 100 gm. were obtained for wheat germ, corn, and peas, respectively; fish and beef liver meals contained 3,750γ and 4,200γ per 100 gm. The results were in good agreement with those obtained by the biological assay method (also noted) except in the case of wheat germ. It is considered possible that the greater growth of the rats receiving the wheat germ might be due to the presence therein of some factor other than lactoflavin that was also lacking in the basal diet.

**Determining riboflavin: A fluorometric and biological method,** G. C. Supplee, R. C. Bender, and O. G. Jensen (*Indus. and Engin. Chem., Analyt. Ed., 11 (1939), No. 9, pp. 495–498, figs. 2*).—A biological method based on the principles of standardization and simplification previously proposed (E. S. R., 81, p. 313) and a fluorometric method representing a perfection of the method presented earlier (E. S. R., 75, p. 743) in preliminary outline are noted in some detail. Results by the two methods are presented and correlated for determinations made on pure riboflavin and on alfalfa meal, raw peanuts, dry yeast, liver meal, soybean meal, and corn meal.

For pure riboflavin solutions, riboflavin concentrates obtained as eluates from fuller's earth, and fuller's earth adsorbates, results by the two methods showed a 95–96 percent correlation. Neither method was found satisfactory, however, when applied to carbon adsorbates; correlations in excess of 90 percent were obtained for dry yeast and raw peanuts; from 80 to 85 percent for alfalfa meal and liver, and less than 50 percent for soybean meal and corn meal. One μg. of lactoflavin per rat per day produced a growth response of substantially 1 gm. per week for a period of 6–8 weeks through a 2- to 10-μg. per day feeding range.

**The use of ascorbic acid (crystalline vitamin C) as a substrate in oxidase measurements,** B. D. Ezell and F. Gerhardt. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 2, pp. 89–99, fig. 1*).—Ascorbic acid substrate possesses the following advantages over a glucose-derivative substrate: (1) It is a definite chemical compound available in pure form, (2) it is more readily oxidized, making the method sensitive to smaller differences in enzyme activity, (3) it is water clear in solution, facilitating titration, (4) it is less injurious to the enzyme, and (5) its use as a substrate saves time, since ascorbic acid is readily soluble in water, and a fresh solution may be quickly prepared. The authors determined the effects of various factors, including the pH value of the substrate, concentration of the substrate, and concentration of the enzyme.

**The physicochemical concentration of vitamin K,** B. Riegel, C. E. Schweitzer, and P. G. Smith (*Jour. Biol. Chem., 129 (1939), No. 2, pp. 495–504*).—Methods for preliminary concentration of vitamin K are described. These include molecular distillation and adsorption with a fuller's earth (florex) from a petroleum ether solution of distillate, previously freed of sterols. The activity could be eluted from the florex with ether containing 5 percent of methanol. On removal of the solvent a dark red viscous oil was obtained containing 40,000 Dam units per gram; 82 percent of the original activity of the sterol-free distillate was recovered. The sterol fraction removed from the distillate was chiefly phytosterol, but chemical studies showed that this fraction also contained α-spinasterol. Carnaubyl alcohol and another inactive substance melting at 54° C. were also isolated from the molecularly distilled concentrate.

## AGRICULTURAL METEOROLOGY

**The meteorological glossary** (*London: Met. Off., Air Min., 1939, 3 ed., pp. 251, [pls. 11], figs. [26]*).—This illustrated glossary contains information in explanation of technical meteorological terms, and at the end is presented a list of the equivalents of a number of the terms defined in the glossary in English, Danish, Norwegian, Swedish, Dutch, German, French, Spanish, Portuguese, and Italian. Many of the words were found to be practically identical in all these languages, and these have been omitted from the list.

**Bibliography of agricultural meteorological literature.—I, Non-Norwegian** [trans. title], K. PRYTZ (*Nord. Jordbrugsforsk., 1939, No. 7–8, pp. 461–481, figs. 5*).

**Monthly Weather Review [January-February 1940]** (*U. S. Mo. Weather Rev., 68 (1940), Nos. 1, pp. 39, pls. 14, figs. 22; 2, pp. 41–61, pls. 16, fig. 1*).—Besides the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and other information, these numbers contain the following:

*No. 1.*—A Brief List of Works on Meteorology, by R. T. Zoch (pp. 1–4); Rainfall Maps of Cuba, by T. W. Chamberlin (pp. 4–10); and On the Structure of Marine Air Over the San Fernando Valley, California, in Relation to Forecasting Summertime Stratus, by H. E. Hutchison and K. C. Fink (pp. 11–16).

*No. 2.*—One Base Map in Place of Five, by B. J. S. Cahill (p. 41).

**[Meteorological data at Windsor, Conn.]** (*Connecticut [New Haven] Sta. Bul. 433 (1940), pp. 168, 169*).—A note on the hailstorm of August 4 is given, and the distribution of rainfall for 1939 is tabulated.

**[Meteorological work by the Nevada Station** (*Nevada Sta. Rpt. 1939, pp. 30, 31*).—Brief reports are included on the present status of projects relating to timber and snow studies and snow surveying, including improvement of the snow sampler and the weighing gage; and forecasting the run-off of the Humboldt River.

**[Meteorological data]** (*Ohio Sta. Bul. 600 (1939), pp. 24, 77–79*).—An analysis of 10 yr. of evaporation at Wooster; a summary of weather conditions for 1937, including the effects on crop plants; and tabulations of precipitation at the station and of climatological data for Ohio and Wooster for 1937.

**Meteorological report for 1938,** F. E. HEPNER (*Wyoming Sta. Rpt. 1939, pp. 45–47*).—This is a brief report on precipitation, temperature, and killing frosts for the year, and tabulated summaries (by months) of air pressure, temperature, precipitation, and wind.

**Direction finding at 1.67-meter waves,** L. C. L. YUAN (*Science, 91 (1940), No. 2370, p. 524*).—The main purpose of the experiment with the radiometeorograph, described in this preliminary report, was to apply the directional effect in obtaining wind velocities.

**The response of the Livingston atmometer to single meteorological factors,** W. J. STAPLE and J. J. LEHANE (*Sci. Agr., 20 (1940), No. 5, pp. 308–310, fig. 1*).—In evaporation tests with the Livingston atmometer at Swift Current, Saskatchewan, it became necessary to determine more definitely what this evaporating power meant in terms of single meteorological factors. In the wind-tunnel tests described, results indicated that the white-sphere atmometer reflects meteorological conditions accurately if equilibrium conditions are maintained. Satisfactory readings resulted when the average wind velocity was high or when changes in velocity or humidity took place slowly. Differences in radiation influence were not held significant under the conditions. Field

tests indicated that the evaporation per unit temperature depression was greater and more varied than the tunnel results predicted. The greater loss in the open was apparently due in part to insolation. Atmometers sheltered from direct sunlight but exposed to wind showed a measurable decrease in evaporation as compared to those fully exposed. A calibration curve is deemed useful in interpreting atmometer data in detailed types of field or laboratory studies. For example, in ecological studies, records of air temperature, wind velocity, and atmometer loss are often obtained near various types of vegetation. With the atmometer loss per unit wet-bulb depression for any wind velocity given, and knowing the rate of atmometer loss and the air temperature, the average wet-bulb depression and water-vapor concentration can be calculated. The same method may be used to calculate integrated values of vapor concentration at different heights above ground.

**Microclimate and growth in tulip beds** [trans. title], O. HÄRTEL (*Bioklim. Beibl. Met. Ztschr., 6 (1939), No. 3, pp. 134–137, figs. 2*).—Calling attention to the importance of microclimates, the author presents evidence that the rapid development and earlier blooming of tulips at the southern edge of the beds is connected with the distinctly higher temperatures of the soil and air as compared with the northern side. Also in the east-west direction there was a similar, though far weaker, influence to be noted. The thermal favorability of the southern side is said to persist overnight.

**The 11-year and 27-day solar periods in meteorology**, H. H. CLAYTON (*Smithson. Misc. Collect., 99 (1940), No. 5, pp. [1]+20, figs. 13*).—The author reviews literature referring to possible relations between solar changes and weather published since the discovery of the 11-yr. period in sunspots, about 1850, and leading to the conclusion that the relations of these changes to terrestrial weather are far more complex than any suggested by simple theories. Recently he has studied the period of solar rotation of about 27 days. Spot groups not infrequently form in some definite longitude on the sun and continue to return opposite the earth for many solar rotations. Oscillations in the number of sunspots approximating a 27-day period were observed in the latter part of 1936 and the first half of 1937, and have been studied in regard to their meteorological relations. Results of these studies of the 27-day period disclosed three distinct factors affecting the earth's atmosphere with increased solar activity as shown by sunspot numbers, viz, an increased flow of air from low to high latitudes throughout the year, an increased flow of air from ocean to continent in winter and the reverse in summer, and the formation of systems of circulating winds or waves that drifted with velocities proportional to the wave length. The meteorological changes found to accompany sunspot changes of short period were even larger than those accompanying the 11-yr. period. It seemed apparent from this that it is not sunspot changes that are the direct influence on weather, but something associated with them. Further examination of the evidence led to the conclusion that variations in solar radiation are the primary causes of the weather changes observed.

**The Connecticut River Valley flood of September 1938 in Connecticut** (*Conn. Ground Water Bul. W-2 (1939), pp. 4+186, figs. 18*).—Following an introduction setting forth the background and participation in this report, there is a general discussion of precipitation records for Massachusetts, Vermont, New Hampshire, and Connecticut, river discharge records at Thompsonville and Hartford, and ground water conditions; a general listing of water stage measurement stations on the Connecticut River; description of measurement stations and tabulation of gage heights along the Connecticut River; comparative flood crests (1936–38), high-water marks (1938), and hurricane wave

marks, Connecticut River; high-water marks of tributary streams; description, grading, and elevations of high-water marks, Connecticut River; description of measurement stations and tabulation of gage heights, and general listing of high-water marks in Farmington River Valley; and description, grading, and elevations of high-water marks on the Farmington River.

## SOILS—FERTILIZERS

**[Soil investigations at the Hawaii Station]** (*Hawaii Sta. Rpt. 1939, pp. 32–35*).—This report notes work on mineralizable nitrogen in soils, by E. T. Fukunaga; the nature of organic phosphorus in soils, by R. Yoshida; radioactive phosphorus in soils, by [S. S.] Ballard and L. A. Dean; organic base-exchange properties of Hawaiian soils, by A. S. Ayres; electrometric determination of base-exchange capacity, by J. B. Bartlett; and routine analyses.

**[Soil investigations at the Nevada Station]** (*Nevada Sta. Rpt. 1939, pp. 38, 39*).—Brief reports on various organic and inorganic phosphates, with special reference to their ability to penetrate soils and to their positional and chemical availability to plants, by V. E. Spencer, R. Stewart, and S. A. Lough.

**[Soil investigations at the Ohio Station]** (*Ohio Sta. Bul. 600 (1939), pp. 7, 8, 9, fig. 1*).—Rebuilding of eroded land and experiments showing no need for "extra plant foods" are reported upon briefly, together with effects of drying on potash fixation in soils and progress of the soil survey.

**[Soil investigations of the South Carolina Station].** (Partly coop. U. S. D. A.). (*South Carolina Sta. Rpt. 1939, pp. 37–42, 182, figs. 2*).—Soil conservation work is reported upon by T. C. Peele and F. Moser under the headings conservative practices and soil fertility, effect on run-off and erosion of organic matter present as a mulch and incorporated with the soil, and run-off and erosion from different soil types. Soil tests are reported upon from the Edisto Substation by R. L. Smith.

**[Soil investigations at the Tennessee Station]** (*Tennessee Sta. Rpt. 1938, pp. 21–27, 52–57, figs. 2*).—Notes on the effect of phosphating on loss of soil by erosion, by K. B. Sanders; a strip-cropping project, by N. D. Peacock; and soils and fertilizers, lime conservation studies, lime-potash experiments, migration of phosphate, fluorine-phosphate relationship, nitrogen conservation, and cooperative fertilizer studies, all by W. H. MacIntire and W. M. Shaw.

**A method for taking soil monoliths,** R. H. Spilsbury (*Sci. Agr., 20 (1940), No. 5, pp. 297–300, figs. 2*).—A trough, open at one end, made by attaching a strip of 22-gage galvanized iron 2 in. wide to a board 36 by 4 by 1 in. is used to obtain soil monoliths in a natural state. The sample is collected by forcing the trough into the exposed soil section through the use of a jack. Cementing materials are not used.

**Standardization of rapid soil testing technique,** C. P. Rivaz and G. C. McLaren (*Sci. Agr., 20 (1939), No. 2, pp. 120–130, figs. 9*).—Photographs and drawings illustrate the equipment devised by workers in the Ontario Agricultural College for rapid handling of large numbers of soil samples sent in for routine examination. A shaker which permits eight samples of soil to be extracted simultaneously, rapidly, and uniformly has been developed, as well as racks for holding glassware. The washing operation has been speeded up by use of jets, and a rotator for mixing alcohol with soil-potassium extract lessens the liability of error in this operation. Reading of the tests is simplified by use of permanent standards and an illuminator equipped with "daylight" bulbs.

**Soil survey of Cattaraugus County, New York,** C. S. Pearson et al. (Coop. [N. Y.] Cornell Expt. Sta.). (*U. S. Dept. Agr., Bur. Plant Indus. [Soil Survey Rpt.], Ser. 1935, No. 12, pp. 65, figs. 2, map 1*).

**Use of the Brunton compass in the Saskatchewan soil survey,** H. C. Moss (*Sci. Agr., 20 (1940), No. 5, pp. 277–280*).—The Brunton compass has proved especially valuable in those areas of Saskatchewan where suitable base maps are not available, or where more detailed soil maps are required. This instrument is useful in all types of soil-survey work, but is particularly valuable in making land inspections and soil maps of individual farms. It has proved sufficiently accurate for the requirements of soil mapping in Saskatchewan.

***A method for obtaining a comparative rating of Saskatchewan soils,*** J. Mitchell (*Sci. Agr., 20 (1940), No. 5, pp. 281–284*).—An index rating for Saskatchewan soils, based on a modification of the system used by Storie (E. S. R., 70, p. 157), has been developed. Three main factors, viz, (1) soil profile, (2) topography, and (3) various (climate, salinity, stoniness, and tendency to drift), are used, and each is subdivided and points are allocated for each subfactor. The total points for the main factor are obtained by adding together those alloted each subfactor, and a final index is arrived at by multiplying the value of the three main factors. It is suggested that for the present an index value of 30 be used as indicative of the point of marginality.

**The nature of soil parent materials in southern British Columbia,** C. C. Kelley (*Sci. Agr., 20 (1940), No. 5, pp. 301–307*).—Most existing British Columbia soils were derived from debris of the Pleistocene ice sheet. Since postglacial weathering produced only a shallow solum, the parent material is significant in land-use classification. Parent materials were organized as a result of glacier movement, freshly ground materials being mixed with Tertiary soil residue; ice recession and advance; ice decay, followed by water transportation and textural grading during run-off; and subsequent erosion. The texture of the whole soil profile is significant from the standpoint of land use.

**Soil surveys in relation to land classification in Alberta,** W. E. Bowser (*Sci. Agr., 20 (1940), No. 5, pp. 285–290*).—The Alberta soil survey has prepared a land-class map which correlates the physical data of the soil map with productive ability.

**The soils of Palestine,** A. Reifenberg, trans. by C. L. Whittles (*London: Thomas Murby & Co., 1938, pp. VIII+131, pls. 8, figs. 4*).—This book gives a general description of the soil formation in Palestine, and includes a survey of the soils of the country, their evolution, and characteristics. Soils in relation to citrus culture, irrigation, and manuring are dealt with, as well as a history of the Zionist colonization, the natural conditions in Palestine in relation to agricultural colonization, and the intensification of agriculture in Palestine and the future of the Zionist colonization.

**Available plant nutrients in lake soils,** E. W. Roelofs (*Michigan Sta. Quart. Bul., 22 (1940), No. 4, pp. 247–254*).—A preliminary report on the relation of the nutrient content of submerged soils to the variety and abundance of water plants supported by them. The lake soils studied are divided into the five general types, sand, clay, slime, peat, and marl, and their pH values and phosphorus, potassium, calcium, magnesium, and iron contents are tabulated, along with the number of species and relative abundance of plant growth.

***Differentiation of forest and agricultural lands,*** D. G. Laird (*Sci. Agr., 20 (1940), No. 5, pp. 291–296, fig. 1*).—Before establishing boundaries between forest and agricultural areas, topography and its relation to natural drainage and watersheds must be carefully considered to insure efficient use of surface and ground waters. The author points out that active cooperation between specialists in forestry and agriculture is necessary to solve this problem.

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**Some soil factors affecting tree growth,** R. M. Salter. (Ohio Expt. Sta.). (*Science, 91 (1940), No. 2365, pp. 391–398*).—The ecological importance of factors which impede or favor the spread and permeation of roots in the soil is emphasized by the increasing evidence that continued root growth and the establishment of new root-soil contacts is necessary for the normal entrance of water and mineral materials into the root. The volume and size distribution of soil pore space largely determines the characteristics of soils with respect to available water capacity, permeability to water, and permeability to air. A better knowledge of root-soil relationships should result from the more general application of interpretative studies of soil pore-space conditions to root development, and from the development and use of micromethods for studying the physical and chemical conditions at the actual root-soil interface.

**Minute amounts of chemical elements in relation to plant growth,** D. R. Hoagland. (Univ. Calif.). (*Science, 91 (1940), No. 2372, pp. 557–560*).—A review.

**Distribution of macro and micro elements in some soils of peninsular Florida,** L. H. Rogers, O. E. Gall, L. W. Gaddum, and R. M. Barnette (*Florida Sta. Bul. 341 (1939), pp. 31, fig. 1*).—Chemical and spectrographic analyses for 7 macroelements and 27 microelements as well as pH, loss on ignition, and insoluble matter are reported for 89 cultivated and 43 virgin soils representing 8 different series occurring in central Florida. The subsoils of a large proportion are included. Soils of the several series were analyzed chemically for a number of elements and for insoluble matter (sand and silica).

An increase in organic matter was found as the drainage of soil decreased. The pH was lower in the poorly drained soils with the exception of the Parkwood series. No correlation was noted in well and poorly drained soils or in the top and subsoils of the various series as to calcium, magnesium, and potassium contents with the exception of the Parkwood series; here considerably greater percentages were noted for all three elements. No correlation was noted between the iron and aluminum content of the various series except in the Parkwood where these 2 elements ran considerably higher.

Of the elements studied phosphorus showed the greatest retention properties. In all cultivated soils there was found an increased percentage of phosphorus as compared with that found in the corresponding virgin soil.

Of the microelements, arsenic, antimony, bismuth, cadmium, thallium, cobalt, tin, molybdenum, lithium, caesium, yttrium, tungsten, lanthanum, and beryllium were detectable in none of the samples by the spectrographic procedure employed. Nickel, silver, vanadium, and lead were detected in a few samples. Titanium, copper, boron, and zinc were detected in practically all samples. Strontium, barium, chromium, manganese, and zirconium were detected frequently. The microelements were detected more consistently in the soils having poor drainage than in those having good drainage. Also, the proportions of the microelements occurring in soils having poor drainage were, in general, greater than or equal to the proportions of the microelements occurring in the soils having good drainage.

**Iodine content of some Texas soils,** D. R. Eegle. (U. S. D. A.). (*Soil Sci., 49 (1940), No. 5, pp. 361–367, fig. 1*).—Although a relatively high iodine content was found in some of the principal soil types of the Blackland prairie and surrounding sections of Texas, no correlation was apparent between the iodine content of the soils studied and the prevalence or severity of cotton root rot. In general, calcareous black clay soils had a higher iodine content than lighter textured noncalcareous Wilson clay loam soils. "The alluvial soils, Harlingen clay and Yahola silty clay loam, found extensively in the lower Rio

Grande Valley and Brazos Valley, respectively, contained less iodine than the residual soils of the Blackland prairie and Grand prairie sections." Geological formations of the Blackland section seem to be primarily responsible for the high iodine content of that area.

**Iron-manganese concretions in Dayton soils,** M. Drosdoff and C. C. Nikiforoff. (U. S. D. A.). (*Soil Sci., 49 (1940), No. 5, pp. 333–345*).—The concretions in Dayton soils (Oregon) range from 0.05 to 15 mm. in diameter. Though concretions are present throughout the A and B horizons, the $A_2$ horizon contains those largest in size and in greatest number. Profile examinations disclose that over 11 percent of the middle part of the $A_2$ horizon consists of concretions largely over 2 mm. in diameter. The $A_1$ horizon contains approximately 4 percent, while the B horizon has but 3 percent, and in the B horizon few are larger in diameter than 2 mm., and firm concretions in the C horizon are rare. A much higher percentage of iron and manganese present as free oxides is found in concretions than in the whole soil. For example, the amount of $Fe_2O_3$ in the concretions ranges from about 8 to 25 percent, which is from 2 to 4 times as much as found in the soil, and the MnO ranges from less than 0.5 to almost 6 percent, which is 75 times as much as contained in the soil. Larger concretions contain a higher concentration of MnO than smaller ones, and the concentration is higher in the lower horizons of the solum. Small concretions, except those less than 1 mm. in diameter, of $Fe_2O_3$ contain a higher percentage of $Fe_2O_3$ than larger ones. Some of the physical, biological, and chemical factors probably involved in concretion formations are discussed. The significance of the local segregation of MnO and $Fe_2O_3$ within each horizon distinguished from vertical migrations from one horizon to another relative to soil genesis is emphasized.

**The boron content of some Okanagan soils,** C. G. Woodbridge (*Sci. Agr., 20 (1940), No. 5, pp. 257–265*). Analyses for boron of representative Okanagan, B. C., soils from experimental plats are recorded. In light soils where heavy amounts of B compounds had been applied B had penetrated to a depth of at least 30 in., while in heavy soils and where lesser amounts of B compounds had been applied B had not penetrated more than 24 in. Various extracting solutions for B in soil were compared, and it was found that no difference existed between $H_2O$ alone and $H_2O$ saturated with $CO_2$, but a 1 percent solution of HCl extracted 1.5–2.5 times as much B as did the others. The amount of B removed by a succession of six extractions of $H_2O$ alone was found to be more than 1.5 times as much as would be indicated by an analysis made on a single extraction.

**Boron deficiencies as revealed by plant and soil tests,** K. C. Berger and E. Truog. (Wis. Expt. Sta.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 4, pp. 297–301, figs. 3*).—The boron present in the leaves of table beets gives an indication of the available boron in the soils on which the beets were grown. It was found that the total boron content of a soil is not a reliable indicator of the need for boron fertilization because, generally, less than 5 percent of the total boron is in available form. The difficultly available form is often present largely as tourmaline. The acid-soluble boron content of a soil gives a somewhat better indication, but does not appear to correlate as well with the incidence of black spot in garden beets as does the amount of boron extracted with boiling water. Acid extractions introduce difficulties in the case of calcareous soils, since these may neutralize all or a part of the acid. Extraction by treatment of the soil with boiling water for 5 min. appears, at the present, to be the best method of extracting the available boron.

**Further researches on the biological action of boric acid** [trans. title], E. Lucchetti (*Ann. Facoltà Agr. R. Univ. Pisa, n. ser., 2 (1939), pp. 304–336;*

*Fr., Ger., Eng. abs., pp. 304, 305*).—Studying the action of boric acid on microorganisms and on the microbiochemical reactions of the soil, on the germination of wheat seeds, on the first shoots of the seedlings, on the enzyme activity of germinating seeds, and on its efficacy as a fertilizer, it is found that for each of these activities there are stimulating and toxic concentrations, which are sometimes very close. As a result of his study the author concludes that B has no nutritive value to plants, but rather that it is a poison capable of a stimulative action if administered in appropriate doses.

**The isolation of phytin from soil,** W. J. Dyer, C. L. Wrenshall, and G. R. Smith (*Science, 91 (1940), No. 2361, pp. 319, 320*).—Though the general behavior of soil organic phosphorus in extraction and fractionation is explainable on the basis that phytin is present in the soil, its presence has not previously been demonstrated. Data presented in two tables "appear to confirm the identity of the soil preparation as ferric phytate." That phytin is promptly fixed in acid soils, presumably by combining with iron, is indicated according to the authors.

**A study on the chemical nature of humic acid,** W. S. Gillam. (Nebr. Expt. Sta.). (*Soil Sci., 49 (1940), No. 6, pp. 433–453, figs. 9*).—Humic acids extracted from gray-brown forest soils from Michigan, muck soil from Minnesota, and grassland soils from the Great Plains area all had very similar physical and chemical properties. These humic acids were negatively charged hydrophyllic colloids, with a low conductivity ranging from 400 to 2,000 reciprocal ohms when suspended in distilled water. They showed low acetyl and methoxyl contents almost identical with those of lignin extracted from prairie soils by alcoholic NaOH. Though the humic acids were readily acetylated and methylated, plant and soil lignins were more completely methylated. All three humic acids had a high base-exchange capacity which was reduced slightly by acetylation and methylation. This reduction, however, was much less than equivalent to the increase in acetyl and methoxyl contents. The three humic acids had hydroxyl groups (alcoholic, enolic, or weak phenolic) which could be esterified or methylated but which do not undergo base-exchange reactions. Potentiometric titration curves indicated a carboxyl group in each humic acid. Since the barium ion flocculated the acids to the extent that reaction could not proceed, potentiometric titrations with barium hydroxide were not successful. The nonnitrogenous fraction of the humic acid is indicated by these studies to consist of a slightly modified lignin complex, and demethylation, hydrolysis, and other chemical reactions causing the formation of phenolic and carboxyl groups probably primarily bring about this modification.

**Organic matter high in nitrogen continuing need for fertile soil,** R. Cowart (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 5, pp. 1, 7*).—This is a brief popular statement of the functions of organic matter in soil fertility and physical condition, the importance of an adequate supply, and the necessity for regular replacement of the organic material used up by micro-organisms in performing their necessary functions in the creation of soil fertility.

**Determination of pore-size distribution in soils,** R. W. Leamer and J. F. Lutz. (N. C. Expt. Sta. and U. S. D. A.). (*Soil Sci., 49 (1940), No. 5, pp. 347–360, figs. 4*).—The size distribution of pores in the soil is measured by a method which applies tension equal to the capillary tensional force developed in the soil. According to permeability studies, percolation and aeration in soils depend on size rather than amount of pore space, and apparently not all soils even of the same mechanical composition have the same sized pores.

**A study of the physical characteristics of soils—with special reference to earth structures,** D. M. Burmister (*Columbia Univ., Dept. Civ. Engin. Bul. 6 (1938), pp. V+61, figs. 23*).—"This paper presents an attempt to bring certain

physical factors into a more unified and consistent pattern by an evaluation of the grading analysis of soils, based on physical as well as simplified statistical considerations. The grading-density relations of granular materials describe basic physical relations and give quantitative expression to the important influence of the distribution of particle sizes and of particle shape upon density. These relations are of fundamental importance because density is one determining factor in the supporting capacity of the natural soil and in the stability of slopes and earth fills of granular materials.

"The plastic characteristics of fine-grained soils are treated in a similar manner in an attempt to define reliable relationships between the simpler soil tests and those describing the behavior of soils. The size characteristics, the grading-density relations, and the plastic characteristics of soils not only form a very valuable and useful basis for describing, comparing, and identifying soils, but also furnish valuable information of a quantitative nature on the behavior of soils. Certain practical applications of these ideas are made in the analysis of soils for earth dams, and methods of analysis and of the presentation of the data have been developed."

**Permeability of saturated sands, soils, and clays,** P. C. CARMAN (*Jour. Agr. Sci. [England], 29 (1939), No. 2, pp. 262–273*).—When the porosity and specific surface are shown, the permeability of water-saturated sand or fine powder can be calculated with considerable accuracy. The Kozeny theory discussed in the paper leads to a useful relationship between porosity and permeability. The author points out that clays do not conform to the theory in its simplest form, but it may be modified to represent satisfactorily the data available. "An important deduction which follows from the modified theory is that clays may have zero permeability at quite considerable porosities."

**Consistency and physicochemical data of a loess pampaneo soil.—II, Properties of natural and homoionic samples of soils and clays,** H. F. WINTERKORN and G. W. ECKERT. (Mo. Expt. Sta.). (*Soil Sci., 49 (1940), No. 6, pp. 479–488, figs. 2*).—In continuation of a previous study (E. S. R., 82, p. 737), this is intended to supply data useful in establishing more clearly the physical and chemical factors influencing the consistency and water-retaining properties of soils. The dominant factor of the topsoil, as indicated by the data, is its elasticity caused by the amount and type of organic matter available. The energy of wetting appears to be the most influential item in the subsoil, and its great avidity for water is apparently not so much correlated with the exchange ions as with the surface of the soil particles as such. Physical soil properties are not likely to be so markedly affected by ionic substitution as by the presence in the soil of ions in excess of exchange capacity.

**The pH of soil as affected by soil moisture and other factors,** M. R. HUBERTY and A. R. C. HAAS. (Calif. Citrus Expt. Sta.). (*Soil Sci., 49 (1940), No. 6, pp. 455–478, figs. 3*).—According to studies on Ramona sandy loam in a California orange orchard in which various irrigational practices were followed, the pH values of air-dried samples were consistently higher than in oven-dried samples. Samples of oven-dried orchard soil when stored in paper bags showed an increase in pH, while oven-drying these samples gave pH values similar to the original oven-dried sample. Stored air-dried samples showing an increase in pH were returned to approximately their original pH on being oven-dried. "The seasonal trends of the curves for pH (1:5 soil: water ratio) are approximately the same regardless of whether the plats were irrigated every 2 weeks during the season (12 irrigations), whenever the first foot of soil below the mulch reached the wilting percentage (6 irrigations), or when the wilting percentage was reached in the first 4 ft. of soil (3 irrigations)." Highest pH values were noted during midsummer. Soil-moisture percentage is of consider-

able importance in the pH of calcareous citrus soils. When a considerable amount of water moved through the soil in plats where 4 in. of water was applied every 2 weeks, the pH values obtained were lower than those from plats irrigated on a monthly schedule.

**Soil moisture studies.—I, Some factors affecting the moisture holding capacity and its determination**, J. C. Wilcox (*Sci. Agr., 20 (1939), No. 2, pp. 140–149, fig. 1*).—These factors were found to affect the moisture-holding capacity of soils under field conditions in British Columbia—type of soil, time after irrigation, depth of sampling, and type of subsoil drainage. Laboratory studies on the effect of grinding and packing the soil, method of wetting, type of drainage, length of soil column, and soil type yielded results which conformed with those made in the field. A figure is included of the soil-tamping apparatus used in the laboratory for packing the soil in 2- by 3-in. tubes.

**Soil-moisture fluctuation under a lawn, as indicated by absorption from porous-porcelain irrigator cones with continuous operation**, B. E. Livingston and S. B. Le Compte, Jr. (*Amer. Phil. Soc. Proc., 82 (1940), No. 3, pp. 227–251, figs. 3*).—To observe soil-moisture fluctuations under out-of-door conditions a water-filled porous-porcelain irrigator cone was buried in the soil, joined by a tube to a reservoir above ground, and a mercury barostat placed between reservoir and cone. By this method, which is figured in detail, the rate of water loss can be measured from time to time without disturbing the soil. Graphs are presented to show the average hourly rates of loss for each day from August 20 to September 27, 1938, for a clay loam soil in Baltimore, Md.

**The water of the Big Horn River.** (Coop. U. S. D. A. et al.). (*Wyoming Sta. Rpt. 1939, p. 10*).—In contrast to last year's report on this work (E. S. R., 81, p. 479), it has now been found that soluble salts are being carried out of the Big Horn Valley more rapidly than they are being deposited both above and below the gage station at Thermopolis. The previous report on only 3 months' flow had indicated some accumulation below Thermopolis.

**The significance of natural erosion**, L. C. Wheeting. (Wash. Expt. Sta.). (*Northwest Sci., 14 (1940), No. 1, pp. 11–13*).—Five samples of soil collected in the vicinity of the Bennett irrigation and silting basin at Wilson Creek, Wash., produced the following dry weights (in grams) of first-crop barley and first-crop alfalfa, respectively: (1) Ritzville soil from a typical wheat field in the drainage area above the basin, 4.9 and 19.1; (2) sediment of relatively coarse material from the upper end of the basin, 14.8 and 18.1; (3) old sediment that had been farmed several years and covered with newer sediment, taken a short distance above the dam at an 8- to 12-in. depth, 7.2 and 17.7; (4) sediment from above the dam deposited in 1936 and not tilled previously, 40.8 and 32.5; and (5) Ephrata fine sandy loam collected in the valley floor below the dam, 4.2 and 12.0.

**Erosion and related land use conditions** (*U. S. Dept. Agr., [Soil Conserv. Serv.], [University Lake Watershed], 1939 pp. 16, fig. 1, maps 2; [Spartanburg Municipal Reservoir Watershed], 1940, pp. 16, fig. 1, maps 2; [Lloyd Shoals Reservoir Watershed], 1940, pp. 26, pls. 4, fig. 1, map 1; [Lake Michie Watershed], 1940, pp. 19, pls. 3, fig. 1, maps 2*).—Conservation surveys are reported as follows: On the University Lake Watershed, Chapel Hill, North Carolina, by T. C. Bass and I. L. Martin; On the Spartanburg Municipal Reservoir Watershed, South Carolina, by T. C. Bass and I. L. Martin; On the Lloyd Shoals Reservoir Watershed, Georgia, by P. H. Montgomery; and On the Lake Michie Watershed, Near Durham, N. C., by I. L. Martin and T. C. Bass.

**Seed propagation of trees, shrubs, and forbs for conservation planting**, C. F. Swingle (*U. S. Dept. Agr., Soil Conserv. Serv., 1939, SCS–TP–27, pp.*

[*205*]).—The author tabulates the species useful in soil conservation plantings, with pounds of seed per 100 lb. of fruit, number of clean seed per pound, time when seed should be collected, cut and germination tests in percentages, conditions suitable for storage of seed, treatment of seed, time of year when seed should be planted, and number of useful plants obtained from 1 lb. of seed. The data were compiled from various published and unpublished sources, especially from those of the technical staff of the Soil Conservation Service.

[**Soils and fertilizers, Kentucky Station**] (*Kentucky Sta. Rpt. 1939, pt. 1, pp. 43–48*).—The report takes up effects of heavy liming on availability of rock phosphate, effectiveness of manure as a carrier of potash, residual effect of limestone, field tests of phosphates, the effect of different cropping treatments on the amount of drainage in lysimeters, availability of phosphates measured in the field and in the greenhouse, measuring availability of phosphorus by chemical methods, effect of liming on phosphorus uptake by crops, and the replaceable potash level of the soil and the use of lime and phosphate fertilizer.

**The liming of soils**, E. C. SHOREY (*U. S. Dept. Agr., Farmers' Bul. 1845 (1940), pp. II+26, figs. 7*).—This is a revision of and supersedes Farmers' Bulletin 921 (E. S. R., 38, p. 819).

**Recent studies on the nature of soil organic phosphorus**, C. L. WRENSHALL, W. J. DYER, and G. R. SMITH (*Sci., Agr., 20 (1940), No. 5, pp. 266–271, fig. 1*).—Most organic phosphorus compounds, when added to the soil, constitute excellent sources of available P and are important components of soil organic matter. Though part of the soil organic P bears a chemical similarity to nucleic acids, it differs greatly from such compounds in its susceptibility to decomposition, for the soil compounds are highly resistant to soil micro-organisms. Part of the soil organic P is extremely resistant to alkaline hydrolysis, and it is difficult to split off all the phosphate by acid hydrolysis. Higher yields of the soil "nucleic acid" are obtained by an improved procedure that has been developed.

***Many State soils return profit from additional nitrogen***, W. B. ANDREWS (*Miss. Farm. Res.* [*Mississippi Sta.*], *3 (1940), No. 5, p. 8*).—The author notes the need for additional fertilizer nitrogen on most Mississippi soils when the commercial 4–8–4 mixture is used. On soils where very little fertilizer has previously been used, however, additional nitrogen may not be profitable. Some of these soils responded to nitrogen only after addition of phosphate. On sandy soils the tendency of soluble nitrogen compounds to leach out may make it preferable to apply the extra nitrogen as a side dressing rather than before planting.

## AGRICULTURAL BOTANY

[**Abstracts of papers**] (*Amer. Chem. Soc. Mtg., 98 (1939), Abs. Papers, pp. 3A, 9A, 10A, 11A–14A, 18A, 21B, 32B, 33B, 6C, 7C, 5I, 8L, 32P, 33P*).—The following are of botanical interest: The Absorption of Some Selenium Compounds By Crop and "Converter" Plants, by O. E. Olson and A. L. Moxon (S. Dak. State Col.); Physiologically Active Growth Substances and the Responses of Plants, by P. W. Zimmerman; Development of Seedless Fruits (Parthenocarpy) by Use of Synthetic Growth Substances, by F. G. Gustafson; Possible Relations of Plant Hormones to Flowering of Plants, by K. C. Hamner; The Relation Between Chemical Structure and Biological Activity in the Auxins, by K. V. Thimann; Plant Growth Factors in Relation to Plant Growth, by J. Bonner; Nitrogen-Free Extract From the Plant-Physiological Viewpoint, by F. E. Denny; Electrophoresis Methods for Isolation and Characterization of Biologically Important Substances, by A. Tiselius; The Determination of Carotene in Fresh

and Frozen Vegetables—Carotene Content of Green Snap Beans and Sweet Corn, by W. I. Zimmerman, D. K. Tressler, and L. A. Maynard; The Carotenoid Pigments of Corn, by W. J. Peterson, J. S. Hughes, and J. A. Webrew (Kans. State Col.); Mineral Elements of the Potato Tuber With Reference to Blackening After Cooking, by W. E. Tottingham (Univ. Wis.); Studies of the Developing Cotton Fiber—I, The Relation of the Development of the Crude Cotton Fiber to the Other Principal Boll Constituents, by J. Compton and F. E. Haver, Jr.; Products and Microorganisms Involved in the Thermophilic Fermentation of Cellulosic Materials, by F. E. Fontaine, W. H. Peterson, and G. J. Ritter; Studies of the Effects of Sulfur Dioxide on Plants and Animals, by C. Setterstrom; Technique for Color Photomicrography, by G. L. Royer; and The Effect of the Hydrogen-Ion Concentration Upon the "Salt Error" of the Quinhydrone Electrode, by A. S. Kenyon and J. L. Gabbard (Univ. Ky.).

[**Abstracts of papers presented before the National Academy of Sciences**] (*Science, 91 (1940), Nos. 2366, pp. 419, 420, 422, 423; 2367, pp. 454, 455; 2368, p. 481*).—The following are included: An Apparently Fundamental Minimum Lethal Ion Equivalent [Using Silver Ions and Cells of the Yeast *Saccharomyces cerevisiae*], by A. Goetz; Introduction of Liquids Into Tissues [Potato Used] by Means of a High Velocity Jet, by G. Failla and T. R. Folsom; A New Group of Filterable Saprophytes [Building Crystal-Like Colonies], by L. O. Kunkel; The Division of Mature Plant Cells Induced by Wounding, by E. W. Sinnott and R. Bloch; Growth Changes Resulting From Chromosome Rearrangement [in Maize], by D. F. Jones; Utilization of Induced Periclinal Chimeras in Determining the Constitution of Organs and Their Origin From the Three Germ Layers in *Datura*, by A. F. Blakeslee, S. Satina, and A. G. Avery; Upward Movement of Salt in the Plant, With Special Reference to Metabolic Activities of Roots, by D. R. Hoagland, T. C. Broyer, and P. R. Stout; Mutations and Reversions in Reproductivity of Aspergilli With Nitrite, Colchicine, and *d*-Lysine, by C. Thom and R. A. Steinberg; The Soil as a Source of Micro-Organisms Antagonistic to Disease-Producing Bacteria, by S. A. Waksman and H. B. Woodruff; and Minute Amounts of Chemical Elements in Relation to Plant Growth, by D. R. Hoagland.

[**Abstracts of papers at the Missouri Valley Branch of the Society of American Bacteriologists**] (*Jour. Bact., 39 (1940), No. 3, pp. 344, 346, 347*).—The following are of interest to botany: Relationship Between Nodule Formation and Nitrogen-Fixing Efficiency of *Rhizobium meliloti*, by J. T. Kroulik and P. L. Gainey (Kans. State Col.); The Effect of Glycine on the Rhizobia, by M. Wolf and I. L. Baldwin (Univ. Wis. et al.); Detection of Hydrogen Sulfide in Bacterial Cultures by Salts of Cobalt and Nickel, by W. P. Utermohlen, Jr., and C. E. Georgi (Univ. Nebr.); Studies of the Toxicity of Basic Fuchsin for Certain Bacteria, by C. Ritter; and Adsorption by Bacteria, by T. M. McCalla (Kans. Expt. Sta.).

**The genus Prospodium (Uredinales),** G. B. Cummins. (Ind. Expt. Sta.). (*Lloydia, 3 (1940) No. 1, pp. 1–78, figs. 12*).—This monograph of the genus includes much new taxonomy. A key to the sections, a list of 19 references, and an index are provided.

**Mycological notes for 1936–38,** L. O. Overholts. (Pa. Expt. Sta.). (*Mycologia, 32 (1940), No. 2, pp. 251–263, figs. 14*).—New taxonomic data are given for various Ascomycetes, Fungi Imperfecti, and Basidiomycetes.

**The flora of central Pennsylvania,** J. P. Kelly. (Pa. Expt. Sta.). (*Pa. Acad. Sci. Proc., 13 (1939), pp. 30–38*).—This is a conspectus (E. S. R., 79, p. 608) of the flora of an area comprising parts of the four counties Centre, Blair, Huntingdon, and Mifflin. Summarizing all current knowledge, there are said to be 1,353 known ferns and seed plants for central Pennsylvania.

**Rocky Mountain trees: A handbook of the native species with plates and distribution maps,** R. J. PRESTON, JR. (*Ames, Iowa: Iowa State Col. Press, 1940, pp. LXXXI+285, [figs. 132]*).

**Environmental influence and transplant experiments,** W. M. HIESEY (*Bot. Rev., 6 (1940), No. 5, pp. 181–203*).—This comprehensive review (89 references) concerns experiments designed to determine the effects of transplanting wild plants from one natural environment to another in order, principally, to answer the questions as to what kind of changes occur and how these changes affect plant classification and concepts of evolution.

**Electron bombardment of biological materials.—II, The rate of death of fungus spores bombarded in vacuum with cathode ray beams from 4 Kv.-15 Kv.,** R. M. WHELDEN, C. E. BUCHWALD, F. S. COOPER, and C. P. HASKINS (*Jour. Gen. Physiol., 23 (1940), No. 3, pp. 391–400, figs. 7*).—The authors report on studies of the rate of inactivation of *Aspergillus niger* spores when bombarded in vacuo with homogeneous beams of cathode rays of energies of 4–15 electron kv. and current densities of $1\times10^{-7}$–$3\times10^{-6}$ a. per square centimeter. These velocities and densities are within the range of those of showers of secondary electrons produced in biological materials irradiated with moderately soft X-rays, and thus may serve as quantitative indicators of the mechanics of X-ray action. Four qualitative effects are described.

**The origin and maintenance of optical activity in living matter,** G. F. GAUSE (*Biodynamica, No. 56 (1939), pp. 23, figs. 2*).—This is a review, with 50 references.

**The effect of the photoperiod on spore formation in Adiantum cuneatum,** J. K. EDWARDS (*Pa. Acad. Sci. Proc., 13 (1939), pp. 24–27, fig. 1*).—In the maidenhair fern (*A. cuneatum*) no evident relation was found between the daily illumination period and the developmental rate of the antheridia and archegonia or the time of production of young sporophytes. The last, however, were definitely influenced by photoperiod, a daily light period of less than 8 hr. inhibiting spore formation and a longer period favoring it. This response is thus comparable to that of a long-day flowering plant, and the comparison becomes more fitting when it is remembered that microspores and megaspores are present in flowers during their early stages.

**Photoperiodic responses of several varieties of soybeans,** H. A. BORTHWICK and M. W. PARKER. (U. S. D. A.). (*Bot. Gaz., 101 (1939), No. 2, pp. 341–365, figs. 10*).—The authors studied floral differentiation of soybeans grown on nine photoperiods, including continuous light. The varieties (normally maturing seed in the field in 105 days or less) Agate, Mandell, Hudson, Manchu, Minsoy, McCrostie Mandarin, Wisconsin Early Black, Batorawka, and Mandarin initiated flower primordia on all photoperiodic treatments used. No plants of the varieties (requiring 125–175 days to mature seed in the field) Biloxi, Avoyelles, Otootan, and Peking, and few of Tokyo, initiated flower primordia on photoperiods longer than 16 hr. The initiation of flower primordia in many varieties under continuous light indicated that darkness is not necessary for this process. In Agate, one of the varieties initiating flower buds most readily under continuous light, the reactions causing induction were accelerated when the plants were subjected to daily periods of darkness. From chemical analyses at ages 2, 3, 4, 5, and 6 weeks, it was found that, in general, Agate contained less total and less soluble forms of nitrogen and more carbohydrates than Biloxi. The starch content of Agate reached a maximum at 3 weeks and declined progressively with age, whereas in Biloxi the trend of the data showed that a maximum had not been reached during the experiment. The maximum carbohydrate content in Agate occurred at the time floral initiation was beginning.

**A study of the mechanism of death by cold in the plasmodium of the Myxomycetes,** P. M. GEHENIO and B. J. LUYET (*Biodynamica, No. 55 (1939), pp. 22, figs. 9*).—The plasmodia studied were killed by temperatures above those at which ice forms, and the freezing point was found to be −0.17° C. The succession of changes induced by slow cooling were cessation of motion at +3° to 0°, formation of hyaline or finely granular vesicles on the surface of the plasmodium at +3° and below, internal protoplasmic disorganization at 0° and below, and break-down of pigment granules during and after protoplasmic disorganization. The progress of death, coincident with that of protoplasmic disorganization, was halted by raising the temperature, the portions not yet affected recovering completely. Tables and graphs show the percentage of recovery under various temperature treatments. Death can result from exposure to 0° for a time as short as 5 sec., and rapid cooling proved more injurious than slow cooling. The changes induced by cold are not specific for this lethal agent, since the same changes have been observed by others with agents such as poisons, radiations, etc. The observed facts are believed to suggest that death by cold without ice formation, in the Myxomycetes, is preceded by a gelation of the protoplasmic sol, and consists in the syneretic break-down of the gel thus formed. There are 32 references.

**Effects of temperature, calcium, and arsenous acid on seedlings of Poa pratensis,** A. W. NAYLOR (*Bot. Gaz., 101 (1939), No. 2, pp. 366–379, figs. 3*).—Germination of Kentucky bluegrass seeds in pots with a high $CaCO_3$ content (pH 8.0) began about a week later than in pots lacking it (pH 5.6). At 35 days after planting the secondary roots formed at the time of germination continued to live in the −$CaCO_3$ series, whereas there were few or none in the +$CaCO_3$ pots. The root length averaged almost twice as much with as without $CaCO_3$. At 90 days after planting, top growth on a substrate with high $CaCO_3$ was ±33 percent (dry weight basis) greater than without it. Considering the effects of temperature and $CaCO_3$, it was found that at 15° C. the presence of this salt was associated with an increase of 77.3 percent in dry weight and at 25° with 135.6 percent, each based on the dry weight of 100 seedlings. The data indicated that the $CaCO_3$ soil content is less important in producing extensive root growth in seedlings than temperature. During the period under study, root growth was definitely greater at 15° than at 25°. The presence of $CaCO_3$ in the substrate was correlated with an evenly increased metabolic activity and growth regardless of temperature, this being especially reflected in the top: root ratios. Under high temperature (22°–23°), liming the soil shortly after germination may be most favorable for establishing a good stand. Germination time was not delayed by arsenic when applied as a 0.01-percent solution, but with increasing concentration there was more and more retardation. With the lowest concentrations, germination and growth were stimulated. An upper tolerance was found for arsenous acid (0.05 percent), a single application of 0.1-percent solution being enough to kill seeds or seedlings. Its harmful effects were progressively less with decreasing concentration from 0.1 to 0.01 percent. Treatment with a 0.01-percent solution induced better germination, and a thicker and taller stand was produced in a shorter time. Considerably higher concentrations were required to kill the growing point of the stem than the leaves. Arsenous acid had a greater toxicity to Kentucky bluegrass seeds than to those of some other grasses tested. There are 24 references.

**Physiological studies of Jerusalem-artichoke tubers, with special reference to the rest period,** C. E. STEINBAUER (*U. S. Dept. Agr., Tech. Bul. 657 (1939), pp. 52, pls. 5 figs. 3*).—During the period of tuber formation and en-

trance into the rest period in the field, changes in their size, number, and composition were noted in two varieties of Jerusalem-artichokes. Of the total weight of tubers and stolons during tuber formation, the proportion represented by the larger tubers increased faster than the proportion of such tubers in the total number of tubers and stolons, indicating a physiological dominance of the first-formed tubers. The time of entering the rest period varied with tuber size, the largest becoming last dormant. Entrance into the rest period was gradual regardless of tuber size. Catalase activity in stolons and terminal buds of tubers reached a maximum at or just before entrance into the rest period. Catalase values for terminal buds of tubers at the time the largest tubers entered complete rest formed an ascending series corresponding with the increasing sizes of tubers from which sample buds were taken. Buds of tubers over 1.4 cm. in diameter exhibited much greater changes in composition during tuber development in most carbohydrate fractions than did whole tubers. The percentage of total hot-water-soluble reducing substances, total levulose, and dry matter were lower, and of free reducing sugars and total alcohol-soluble reducing substances higher in buds than in whole tubers early in development. Percentages of the various constituents in buds tended to approach those of whole tubers toward the end of the test periods (± October 10). An accumulation of the less labile reserve carbohydrates seemed to bear a high degree of association (but not causal relation) to the resting condition. Only 4 of ± 50 treatments involving 15 chemical compounds applied in different ways and concentrations used on 4 varieties of tubers during 2 seasons were consistent in giving sufficient shortening of rest without noticeable toxic effects to be worthy of recommendation. No chemical treatment tried proved entirely satisfactory in giving rapid sprout development after breaking of the rest period.

The sprouting response was prompt and vigorous from tubers stored at 32° and 36° F. and in field pits and was best at 32°. The exposure period for good responses at 32° and 36° and in field pits varied among seasons and varieties, but 30–45 days' exposure gave good sprouting and subsequent growth in all varieties and seasons tried. There was no conclusive evidence of correlation between the composition of tubers or tuber buds and time of emergence from the rest period, but the data indicated a gradual attainment of a low value of levulosans and of a correspondingly high value of the more soluble carbohydrates from harvest to the time of bud growth. The content in free reducing substances and free levulose showed excellent inverse relationships with temperature of exposure in some varieties, yet none of these fractions could be detected in tubers of other varieties subjected to like conditions. Therefore, these substances cannot be important in the growth-release process. Tuber buds and whole tubers subjected to 50° tended to be higher in levulose and the ratio of levulose to hot-water-soluble reducing substances and lower in alcohol-soluble reducing substances than those exposed at lower temperatures. In a limited test there was no good correlation of the nitrogen fractions with either temperature of exposure or breaking of rest period. The constituents studied in the variously exposed tuber buds and tubers did not appear to control or be related to breaking of rest, although some of them seemed important in determining the vigor of sprout growth following rest. No consistent relations were found between catalase activity of buds and tubers and respiration of tubers or between either of these factors and sprouting response after storage at 50° and 32°. The evidence suggested that breaking of rest in buds is governed by an entirely different agent from that operative in subsequent development. It is noted that termination of rest, at least in some plant materials, cannot be judged with certainty by the time sprouts appear above ground in sprouting tests. It is apparent that

where tubers are to be used for manufacturing purposes requiring high inulin or levulose contents they should be used immediately after harvest or after only short storage. Large losses from rotting of tubers occurred during storage at 50°, but temperatures slightly above freezing reduced such troubles to a minimum.

**Nutrition studies with corn.—III, A statistical interpretation of the relation between nutrient ion concentration and the carbohydrate and nitrogenous content of the tissue,** J. R. Beckenbach, W. R. Robbins, and J. W. Shive. (N. J. Expt. Stas.). (*Soil Sci., 49 (1940), No. 3, pp. 219–238, figs. 16*).—In continuation of the series (E. S. R., 79, p. 600), and within the limits used in this statistical study, $PO_4^{\equiv}$ and $SO_4^{=}$ concentrations were found to have no demonstrable correlation with N metabolism. Increasingly high $NO_3^-$ concentrations in the substrate increased the contents of nitrate, $NH_4$, basic-free α-amino, amide, basic, and protein N in the tissues. Increasingly high concentrations of $NO_3^-$ in the substrate decreased the tissue content of reducing sugars, starch, dextrins, and hemicelluloses. Increasingly high concentrations of $Ca^{++}$ in the substrate decreased slightly the soluble N fractions, increased slightly the protein N content, and increased the complex reserve carbohydrate content of the tissues. No significant correlations were noted between $Ca^{++}$ in the substrate concentration and the reducing sugar and sucrose contents of the tissue. Increasingly high $Mg^{++}$ concentrations within the limits used had no appreciable effect on the carbohydrate-N relationships. Increasingly high $K^+$ concentrations in the substrate had little effect on the protein or basic N contents of the tissues but decreased the tissue contents of all other soluble N fractions and of the reducing sugars, and had no appreciable effect on the sucrose, starch, dextrin, and hemicellulose contents of the tissue. It is suggested that K may be essential to the processes by which energy utilized in N metabolism is released from the simple sugars.

**On the plasmolysis form in Allium cepa, with special reference to the influence of potassium ion upon it,** N. Takamine (*Cytologia, 10 (1940), No. 3, pp. 302–323, figs. 14*).—When onion epidermal cells were plasmolyzed with a 0.5 M KCl solution, concave plasmolysis continued longer than hitherto expected when the material was kept in a healthy condition and the treatment carefully carried out. The cells reacted more sensitively to plasmolysis by KCl than by $CaCl_2$ or sucrose. The plasmolysis time was shortened by illuminating the preparation, which accords with the fact that light increases protoplasmic permeability. The plasmolysis time was greatly prolonged by the addition of $Ca^{\cdot\cdot}$ or $Al^{\cdot\cdot}$ ions to the $K^{\cdot}$ ions in the preparation.

**Use of chemical stimulants, hormones, and vitamins in plant culture,** R. B. Harvey. (Minn. Expt. Sta.). (*Minn. Hort., 68 (1940), No. 3, pp. 48, 50, 51*).—A general summary of the present status of the subject.

**Growth hormones in plants,** K. V. Thimann (*Jour. Franklin Inst., 229 (1940), No. 3, pp. 337–346, figs. 6*).—A review (13 references) of the development of knowledge on growth factors for plants.

**Growth factors for bacteria.—X, Additional factors required by certain lactic acid bacteria,** E. E. Snell and W. H. Peterson. (Wis. Expt. Sta.). (*Jour. Bact., 39 (1940), No. 3, pp. 273–285*).—In continuation of this series (E. S. R., 82, p. 463), the finding was confirmed that vitamin $B_1$ is required by certain lactic acid bacteria. In addition evidence is given for the existence of two other as yet unidentified growth factors required by some of these organisms for growth in a medium containing amino acids and the known growth factors. One of the latter has been considerably purified, and some of its properties are described. It is shown to be basic in nature, labile to oxida-

tion, precipated by many of the common basic precipitatns, and to exhibit some properties in common with spontaneously occurring purines.

**Growth substances and gametic reproduction by Phycomyces, W. J. Robbins** (*Bot. Gaz., 101 (1939), No. 2, pp. 428–449, figs. 5*).—At 25° C. the intensity of gametic reproduction in *P. blakesleeanus* on an agar medium containing dextrose, asparagine, mineral salts, and thiamin was affected by the distance between the inocula of the plus and minus strains, by the agar concentration, by addition of plant extracts, by the amount of asparagine, and less so by that of carbohydrate. It was decreased with greater distance between inocula and by larger amounts of asparagine, but was favored by increasing agar concentration and by adding plant extracts. The beneficial substances in agar could be extracted in part by dilute methyl alcohol or by aqueous pyridine. Addition of plant extracts partly overcame the inhibitory effect of the larger amounts of asparagine. But little gametic reproduction was obtained at 25° in the fluid medium above noted unless a plant extract was added. It is believed that growth factors in addition to thiamin are probably concerned in the gametic reproduction of this fungus. There are 17 references.

**Further studies on growth substances in relation to the mechanism of the action of radiation on plants, H. R. C. McIlvaine and H. W. Popp.** (Pa. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 3, pp. 207–215*).—Studies (E. S. R., 79, p. 27) were continued, with particular reference to the action of regions of the visible spectrum. Turnip seedlings, grown for 3.5 or 7 days, were periodically irradiated under varying conditions, the sources being daylight, a 500-w. Mazda lamp, a General Electric mercury-vapor lamp in glass, and a mercury-vapor lamp in quartz. Corning glass filters were used, and, where possible, exposures were such as to equalize the total incident energies. Exposures to varying conditions of daylight and darkness were also made. At the end of the experiments the amounts of growth substance in the seedling tips were determined by a modified Went *Avena* curvature technic, records indicating a positive correlation between seedling height and amount of growth substance. In all cases results showed that when seedlings are subjected to the shorter visible wavelengths, the height is less, and there is a smaller amount of growth substance. Two series of tests indicated that the growth substance is inactivated appreciably by daylight and that it tends to accumulate in darkness. In general, the data substantiated the authors' previous conclusions that the formative effect of radiation may at least in part be explained on the basis of the effect of radiation on growth substances in the plant.

**Evidence for auxin production in isolated roots growing in vitro, J. Van Overbeek** (*Bot. Gaz., 101 (1939), No. 2, pp. 450–456*).—Evidence is presented to indicate that auxin is produced in isolated pea roots cultured in vitro under sterile conditions. The roots were so treated that at the end of each week the culture was continued with a 10-mm. tip only. Discarding the basal parts of the roots growing ±700 mm. per week, the total amount of auxin extracted from them during 20 weeks' culture was found to be 9 times as great as that extracted from the initial tip from which the cultures originated. Even at the end of 34 weeks' culture, roots contained as much as $1,000\times^{-6}\gamma$ of indoleacetic acid equivalents of auxin per root.

**Comparison of growth responses induced in plants by naphthalene acetamide and naphthalene acetic acid, J. W. Mitchell and W. S. Stewart.** (U. S. D. A. et al.). (*Bot. Gaz., 101 (1939), No. 2, pp. 410–427, figs. 10*).—Naphthaleneacetamide induced growth curvatures in the pea test and in *Avena* coleoptiles when applied unilaterally as a 0.02-percent lanolin mixture. Applied to coleoptiles at 250γ per liter in *Avena* agar blocks, the acetamide gave no growth

curvatures, while napthaleneacetic acid induced such curvatures in both pea and *Avena* at 1 mg. per liter and 250γ per liter, respectively. Unilateral applications of the acetamide- (2 percent) lanolin on stems of etiolated pea and kidney bean gave negative curvatures, but none were apparent when stems of four-o'clock, soybean, and tomatoes grown under natural light were treated with it unilaterally. The petunia and kidney bean, treated thus, exhibited slight negative curvatures. Napthaleneacetic acid- (2 percent) lanolin resulted first in negative and then in positive bending in all except kidney beans grown in the light. The negative curvatures here were interpreted as resulting from initially low concentrations. Growth was apparently inhibited on the side nearest application as the tissue concentration of the acid increased. Applied in strong concentrations to bean plants as emulsion sprays, the two compounds inhibited development of terminal buds and expansion of primary leaves. The acetamide stimulated root growth but the acid did not. The less concentrated acetamide sprays accelerated top growth somewhat, while the acid sprays had no noticeable effect. The 2-percent lanolin-acetamide or -acid terminally applied to decapitated beans or laterally applied to stems resulted in mobilization of solid materials toward the treated region. This was associated with appreciable secondary thickening in plants treated with the acetamide and with marked cellular proliferation in those treated with the acid.

**Further experiments on the relation of vitamin $B_1$ to the growth of green plants,** J. Bonner and J. Greene (*Bot. Gaz., 101 (1939), No. 2, pp. 491–500, fig. 1*).—Continuing their studies (E. S. R., 80, p. 322), the authors show that plant species grown in sand culture or in soil in the greenhouse were found to respond to addition of vitamin $B_1$ to the nutrient solution with marked increases in rate of dry weight accumulation. Carob trees (*Ceratonia siliqua*) supplied with the vatimin on alternate days in sand culture for a year continued to exhibit a higher growth rate than controls. This and other tests indicated that the promotive force of added vitamin is lasting. Tomato, which fails to respond to vitamin $B_1$ additions with increased growth, contained at least three times as much vitamin in its leaves as was found in the leaves of other plants (*Cosmos, Poa, Brassica*, etc.) which did so respond to the treatment. *Pisum sativum*, another plant unresponsive to added vitamin, contained more than twice as high a concentration of leaf vitamin $B_1$ as the responsive species. It is suggested that the amount of this vitamin synthesized by leaves of a given species regulates at least in part the response to added vitamin. It is deemed possible that the leaf vitamin content might be used to show whether or not addition of vitamin $B_1$ would promote growth in a given plant. When this vitamin is supplied to roots of plants grown in sand culture, the vitamin content of the leaves is increased over that of controls.

**Catalysts, catalyst-modifiers, life and the specificity of vital processes,** J. Alexander (*Biodynamica, No. 54 (1939), pp. 32, figs. 6*).—This is a review and general discussion of the subject, with 55 references.

**Biological oxidation,** C. Oppenheimer and K. G. Stern, with collab. of W. Roman (*'s Gravenhage (The Hague): W. Junk, 1939, pp. IX+[2]+317, figs. 17*).—A comprehensive theoretical consideration is given of biological oxidation catalysis, including a discussion of historical aspects of the subject, extension and reshaping of previous theories, and presentation of a theory of chain reactions. The general part of the work also takes up the phenomena of oxidative catalysis via peroxides. The special part considers the enzyme system (theoretical fundament, and descriptive chemistry of enzyme system), general biological significance or desmolysis, and cell respiration (main and accessory respiration), and the intermediary catalysis (mesocatalysis)). An index and 1,383 references are included.

**Synthesis of coenzyme R by certain Rhizobia and by Azotobacter chroococcum,** F. E. ALLISON and F. W. MINOR. (U. S. D. A.). (*Jour. Bact., 39 (1940), No. 4, pp. 373–381, figs. 2*).—Two *Rhizobium* strains from *Dalea*, which grew rapidly without added coenzyme R, synthesized and liberated it into the medium in comparatively large amounts. Similar results were obtained with a culture from *Coronilla varia* nodules, except that the amount synthesized was considerably less. One culture of *R. meliloti*, which grew on a medium free from this coenzyme, showed a slight synthesis. *A. chroococcum* proved to be an active synthesizer of the growth substance, but the amount formed was not quite as large as for the *Dalea* organism, though the latter liberated it into the medium less rapidly than *Azotobacter*. Coenzyme R is clearly distinguished by its properties from the thermolabile factor found by West and Wilson (E. S. R., 81, p. 182) to be synthesized by a strain of *Rhizobium* not producing coenzyme R. In general, most rapidly growing Rhizobia require additions of this coenzyme to the medium. Those tested that grew well without it synthesized it, and often in amounts far beyond their expected needs. This work thus in no way contradicts the authors' previously reported conclusions regarding the essentiality of coenzyme R.

**The effect of temperature on the growth rates of Rhizobia,** F. E. ALLISON and F. W. MINOR. (U. S. D. A.). (*Jour. Bact., 39 (1940), No. 4, pp. 365–371, figs. 2*).—Laboratory studies of nine cultures representing five species of *Rhizobium* indicated the optimum growth rate for most of them to be between 29° and 31° C., though *R. meliloti* grew best at 35°. Where several species are being studied 28° is recommended. No growth occurred within 24–48 hr. with most species kept at 37°, but 41° was required to prevent growth of *R. meliloti*. The growth rate at 15° was ±0.25–0.50, as great as at 30°. The temperature characteristic of growth at 15°–25°, based on a limited number of observations, was calculated to be 16,900 calories.

**Non-effective associations of nodule bacteria and legumes, with particular reference to the influence of the host plant,** T. H. STRONG (*Jour. Austral. Inst. Agr. Sci., 6 (1940), No. 1, pp. 14–20, figs. 3*).—From experimentation and a review of the literature it is deemed probable that some host factor determines whether a rhizobial strain of the species for the particular cross-inoculation group is effective or noneffective. In the presence of the appropriate host, a strain may be highly effective or partially effective, depending on its virulence. Normally, effective strains may become parasitic under particular environal conditions, such as when the carbohydrate supply to the nodules is restricted by shading or when an element such, e. g., as boron is lacking. Furthermore, the occurrence of bacteriophage is of particular interest, and soil conditions may also exert a profound influence over the activities of *Rhizobium* and the production of nodules. An accompanying diagram shows the various types of symbiotic association discussed, and it is suggested that the abnormal strain, parasitic in the absolute sense, is of doubtful occurrence.

**Mycorhizae and growth of Pinus and Araucaria: The influence of different species of mycorhiza-forming fungi on seedling growth,** H. E. YOUNG (*Jour. Austral. Inst. Agr. Sci., 6 (1940), No. 1, pp. 21–25*).—Using *Russula* sp. and several species of *Boletus*, the author indicated that these different mycorhiza-forming fungi may vary considerably in their capacity for stimulating growth of *P. caribaea*. In contrast to the mycorhiza of *P. caribaea*, that of hoop pine (*A. cunninghamii*) is endotrophic in form, and the exact identity of the fungus involved is yet unknown. From tests of this fungus and *B. granulatus* it is concluded that under the experimental conditions no different effect was produced by the two organisms. Both in flask and box experiments the fungi used produced endotrophic mycorhizas with hoop pine. With *Pinus*, *B.*

*granulatus* produced ectendotrophic mycorhizas. "It would appear in this connection that with the *B. granulatus-Pinus* and *B. granulatus-Araucaria* associations, the nature of the mycorhizas is a host, rather than a fungus, reaction."

**The colouring matters of Penicillium carmino-violaceum Biourge, with a note on the production of ergosterol by this mould,** H. G. HIND (*Biochem. Jour., 34 (1940), No. 1, pp. 67–72*).—Investigation of the coloring matters of *P. carmino-violaceum* Biourge has led to the isolation of two complex anthraquinones, which have been named carviolin ($C_{16}H_{12}O_6$) and carviolacin ($C_{20}H_{16}O_7$), respectively. The preparation of various crystalline derivatives of these pigments is described and throws light on their constitutions. Ergosterol was isolated from the mold."

**Plant microtechnique,** D. A. JOHANSEN (*New York and London: McGraw-Hill Book Co., 1940, pp. XI+523, [pl. 1], figs. 110*).—"Four considerations prompted the preparation of the present text: (1) The acute necessity for a sifting and synthesis of the hundreds of methods and procedures that have been proposed during the past 10 yr. of rapid development in microtechnic, (2) the need for a manual of modern botanical technic methods by botanists lacking special training in that field but who must prepare slides as part of their work in other fields, (3) to bring together the accumulated and mostly unpublished results of some 16 yr. of extensive personal experience in collecting materials and preparing slides of plants from over the entire range of the plant kingdom, and (4) to provide an answer to the increasingly numerous inquiries received by the author concerning the methods he employs in routine and research work."

The two sections of the book deal, respectively, with general methods and special methods for the various plant phyla.

**Time savers for fixing and dehydration,** J. W. DUFFIELD. (U. S. D. A.). (*Stain Technol., 15 (1940), No. 2, pp. 57–59, figs. 2*).—"A double wash bottle for dispensing two-part fixing solutions is described. Equal volumes of each stock solution are delivered simultaneously into the same vial. A device for dehydrating tissues consists of a Buchner funnel closed at the bottom by a rubber tube and pinch clamp which facilitate changing the dehydrating alcohols. Tissues are placed in perforated brass baskets in the funnel."

**The use of acenaphthene in pollen tube technic,** C. P. SWANSON (*Stain Technol., 15 (1940), No. 2, pp. 49–52, figs. 2*).—In this procedure for growing pollen tubes so that a large number of clearly analyzed figures may be obtained, the grains are sown on an artificial medium of sugar, agar, gelatin, and water, varying in proportions according to the plant species used. This medium is smeared on the slide while still hot to insure a thin covering, and the grains are dusted on after sufficient cooling and hardening. The slides are placed in a staining dish with slide slots, the inside of the cover and bottom of which is lined with moist filter paper. Acenaphthene crystals are lightly sprinkled on the bottom of the dish. As a result of exposure to the fumes and consequent disturbance of the spindle mechanism, the chromosomes are not crowded on a metaphase plate but are widely separated in the tube, thus facilitating observations.

**A labor-saving technique for leaf samples in histological work,** W. E. GORDON. (Univ. Minn.). (*Science, 91 (1940), No. 2364, p. 390*).—In collecting samples from various parts of the same leaf or from similar portions of different leaves for histological study, the accurate recording of the source of each sample and the maintenance of its identity throughout the stages of preparation and storage before sectioning is greatly facilitated by using India ink index numbers on the sample itself and on the portion of the leaf adjacent to it. Details of the procedure are described.

**Card mounts for handling root tips in the paraffin method,** L. F. RANDOLPH. (U. S. D. A. and Cornell Univ.). (*Stain Technol., 15 (1940), No. 2, pp. 45–48, figs. 4*).—By the method described, the freshly collected roots are attached to temporary card mounts measuring ±2 by 2.5 cm. with DuPont Household Cement or similar adhesive that hardens quickly in ordinary aqueous fixing fluids and is insoluble in the lower grades of alcohol. After fixation and running up to 75-percent alcohol, the roots are transferred to permanent card mounts and carefully oriented for sectioning. Mucilage or glue which hardens quickly in 85-percent alcohol and is insoluble in the ordinary dehydrating and infiltrating media is used for these permanent card mounts. Detailed procedures are given for handling and labeling these mounts.

**Use of the Feulgen reaction in cytology.—I, Effect of fixatives on the reaction,** B. B. HILLARY (*Bot. Gaz., 101 (1939), No. 2, pp. 276–300, figs. 3*).—In vitro tests with nucleic acid-impregnated agar blocks, using four types of fixatives, indicated that the Feulgen nuclear stain gives two types of staining curves, depending on the presence or absence of chromic acid in the fixative. With fixatives not containing it the maximum stain is produced by hydrolysis at 60° C. for 4–8 min., after which a gradual falling off of the stain occurs until at 30 min. no further stain is visible. With fixatives containing chromic acid the maximum stain is produced by hydrolysis at 60° for 5–30 min. That retention of the stain with increased hydrolysis is due to chromic acid was shown by testing the individual ingredients of the fixatives separately. None of them in concentrations normally used interfered with the stain. Tannins had the same effect as chromic acid in retaining the stain, except with a stain containing formalin, in which case there was a weakening of the stain. Various plants from different systematic divisions, when treated with the four fixatives in the same way as the agar blocks, gave the same results. It is concluded, in general, that for production of a satisfactory stain 5 minutes' hydrolysis with any of the regularly used cytological fixatives is sufficient. There are 34 references.

**Delafield's hematoxylin and safranin for staining plant materials,** H. L. DEAN (*Stain Technol., 15 (1940), No. 2, pp. 61–65*).—By this method, tissues are first stained in Delafield's hematoxylin. A short bath in acidulated water removes objectionable precipitates and destains. This is followed quickly by thorough washing in tap water or dilute lithium carbonate to restore the original dark-blue color and to set the stain. Once the hematoxylin solution is satisfactory, it is said that none of the reagents ordinarily used will remove it unless they contain acid. Tissues are counterstained in rapid safranine, which is destained in 50-percent ethyl alcohol to sharp differentiation. Dehydration and mounting are carried out as usual. This schedule allows each stain to be individually and independently controlled by the operator.

**Chlorazol black E as an aceto-carmine auxiliary stain,** B. R. NEBEL. (N. Y. State Expt. Sta.). (*Stain Technol., 15 (1940), No. 2, pp. 69–72, figs. 5*).—Where acetocarmine was unsatisfactory in making chromosome counts on plants and plant parts treated with colchicine, the following method proved effective: Dissect out under a binocular or section free-hand the meristematic parts of the axillary bud and transfer at once to a 3-to-1 solution of alcohol and acetic acid for killing and fixing, allowing to act at least 10 min. Wash in at least three changes of 70-percent alcohol, and stain 5–25 min. in 1-percent chlorazol black E in 70-percent alcohol. Rinse in three changes of 70-percent alcohol, transfer to a slide, cover with a drop of acetocarmine, and, if necessary, dissect further. Apply the cover glass, heat, flatten, and seal, or run Zirkle's fluid

under the cover for permanent mounting. For smears of sporocytes, chlorazol black E may also be used alone or combined with acetocarmine if a dark purple nuclear stain is desired.

**An X-ray examination of delignified and cellulosan-free cellulose and its significance for the problem of the structure of cell walls**, R. D. Preston and A. Allsopp (*Biodynamica, No. 53 (1939), pp. 8, figs. 6*).—Removal of lignin and xylan from coir and from the wood of various tree species caused no fundamental change in the X-ray diffraction pattern of cellulose. Lignin removal involves a decrease in the angular dispersion of the cellulose chains and, in coir, a slight change in their orientation. Removal of cellulosans from the delignified material had little further effect. These results support the conception that lignin occurs in the "intermicellar" spaces rather than within the cellulose micellae themselves.

**Infrared photomicrography reveals plant cell-wall structure**, W. F. Fowler, Jr., and W. M. Harlow (*Paper Indus. and Paper World, 21 (1940), No. 11, pp. 1159, 1160, figs. 3*).—Such photomicrographs of transverse sections of eastern white pine (*Pinus strobus*) wood clearly show the structure of the "compound middle lamella," resolving it into its component parts, the primary wall and the true intercellular substance. Previous observations on the primary wall, made after chemical treatment of thin sections, were confirmed.

**Ontogenetic and anatomical studies of the flower and fruit of the Fagaceae and Juglandaceae**, L. M. Langdon (*Bot. Gaz., 101 (1939), No. 2, pp. 301–327, figs. 70*).—A critical study is presented of certain of the woody catkin-bearing angiosperms, with particular attention to the Casuarinaceae, Fagaceae, and Juglandaceae. Life histories were followed in detail, and all conclusions relating to floral structure are supported by comparative studies of vascular organization. The principal object was to secure additional data bearing on the perplexing problem of the relationship of the various members of these families to one another and to the rest of the angiosperms. There are 45 references.

[**Papers presented at the Third International Congress for Microbiology, New York, September 2–9, 1939**] (*3. Internatl. Cong. Microbiol., New York, 1939, Rpt. Proc., pp. 54–86, 98–118, 155–159, 160–163, 164, 174, 187–192, 196–200, 204, 205, 209–211, 215–217, 220, 225, 226–230, 230–234, 239, 240, 243, 244, 245–247, 249, 252, 253, 254, 255, 263–265, 294–296, 297–299, 485–492, 493, 494, 495, 496–502, 504, 505, 533, 536–543, 544, 545, 551, 552, 557, 561, 562, 563, 564, 686, 687, 699, 743–746, 747, 748, 750–752, 753, 754*).—The following five lectures (pp. 54–86, 98–118) and abstracts of papers are of interest to botanical science:

Electrophoresis Methods for the Isolation and Characterisation of Biologically Important Substances, by A. Tiselius (pp. 54–62); Bacterial Nutrition, by P. Fildes (pp. 63–72); Microbial Metabolism and Its Significance to the Microbiologist, by A. J. Kluyver (pp. 73–86); The Significance of the Conceptions Genotypus and Phaenotypus to Bacteriology, by J. J. van Loghem (pp. 98–106; Some Problems in the Genetics of the Fungi, by B. O. Dodge (pp. 107–118); Changes in the Outline of Classification Introduced in the Fifth Edition of the Bergey Manual of Determinative Bacteriology, by R. S. Breed, E. G. D. Murray, and A. P. Hitchens; A Code of Bacteriological Nomenclature, by R. E. Buchanan; Morphogenesis of Bacteria and the Formation of Colonies With Respect to Bacterial Variation, by A. Fontes; The Influence of Variation on the Classification of Bacterial Species, by S. Soriano and A. M. de Soriano; Bearing of Dissociative Variation of the Species-Concept Among the Schizomycetes, by P. Hadley; Motion Pictures of the Development of Bacteria From a Single Cell, by M. C. Kahn; A Serological Analysis of a Bacterial Population, by E. F. McCoy; Taxonomic Sig-

nificance of Comparative Biochemistry, by E. A. Pribram; Independent Variation in Several [Bacterial] Characters, by G. B. Reed; Bacterial Type Transformation, by H. A. Reimann; Studies on the Taxonomy of the Mesophilic Bacilli, by N. R. Smith; The *Aspergillus-Penicillium* Relationships, by C. Thom; Variations in *Aspergillus* [trans. title], by R. Mosseray; Classification of *Aspergillus* and *Penicillium* and Their Nitrate Metabolism [trans. title], by P. Simonart; On What Grounds Can a Classification of Actinomyces and Allied Organisms Be Made? by C. Naeslund; The Structure, Development, and Classification of Actinomycetales, by N. Krassilnikov; On the Classification of Actinomycetes, by S. A. Waksman and W. W. Umbreit; Cultural Bases for Nomenclature of the Dictyosteliaceae, by K. B. Raper; Dissociation of Yeast-like Fungi, by J. E. MacKinnon; Taxonomy of the Anascosporous Yeast-like Fungi, by N. F. Conant; On the Taxonomy of the Asporogenous Yeasts Forming a Pseudomycelium, by H. A. Diddens and J. Lodder; Variations Occurring in Type Culture Collections, by J. Westerdijk and H. A. Diddens; The Proteases of Aerobic and Anaerobic Bacteria [trans. title], by E. Maschmann; A Chemically Pure Yeast Peptidase, by M. J. Johnson; Bacterial Phosphatases, by L. B. Pett; Enzymatic Cellular Divergencies of Bacteria, by C. Gorini; A Study of the Constitutive and Adaptive Enzymes of a Soil Organism Capable of Decomposing Creatinine, by B. F. Miller and Z. Baker; Studies on the Metabolism and on the Proteolytic Enzymes of the Strict Anaerobes, by J. C. Hoogerheide and L. Weil; The Production of Tryptophanase by Bacteria, by F. C. Happold; The Problem of the Bacterial Cell Nucleus [trans. title], by G. Piekarski; Studies on an Enzyme-Resistant Protein of *Aspergillus sydowi*, by D. W. Woolley and N . Bohonos; A New Type of Bacterial Pigment, by A. J. Kluyver and T. Hof; The Pigments of Penicillia [trans. title], by T. Posternak; *Rhizopus oryzae*—Spore Germination, Early Growth, and Fermentation, by L. B. Lockwood; Reversible Heat Activation of Respiration, Fermentation, and Germination in the Spores of the Fungus, *Neurospora*, by D. R. Goddard; Studies in the Biochemistry of the Fusaria, by B. S. Gould, A. A. Tytell, and W. L. Hughes, Jr.; Physiological Studies on Fumaric Acid Formation by *Rhizopus*, by J. W. Foster; On the Biochemical Formation of Plant Acids From Hexoses, by V. S Butkevitsch; The Respiratory Systems in Bacteria, by E. S. G. Barron; Luminescence and Respiration in Bacterial Metabolism, by F. H. Johnson and E. N. Harvey; Carbon Dioxide Reduction With Molecular Hydrogen in Purple Bacteria and Green Algae, by H. Gaffron; The Utilization of $CO_2$ by Bacteria, by H. G. Wood and C. H. Werkman; Bacterial Photosynthesis and Oxygen, by C. B. Van Niel; The Formation of Porphyrins by Yeast-Cells and by Enzymes Extracted From Yeast, by J. Thomas and E. J. Bigwood; The Dependence of the Oxygen Optimum of Bacteria on Their Nutritive Conditions [trans. title], by H. Braun; Oxygen Demand and Oxygen Supply in Bacterial Cultures, by O. Rahn; Influence of the Electric Field of the Atmosphere on Bacterial Development [trans. title], by A. Seppilli; Theoretical Studies of the Death of Microbes by Irradiation [trans. title], by P. Jordan; The Influence of Ultrashort Electric Waves on Living Bacterial Cells [trans. title], by W. Schwartz and E. Sauter; The Action of Radio-Active Radiations on Bacteria, by R. B. Haines and D. E. Lea; Modes of Action of Monochromatic Ultraviolet Radiation on Micro-organisms, by A. Hollaender; Studies on Purified Bacteriophages, by W. J. Elford; A Simple Method for Concentration and Purification of Bacteriophage, by J. J. Bronfenbrenner and G. Kalmanson; The "Precursor" of Bacteriophage, by A. P. Krueger; The Effects of Ultra-Violet Radiation and of Roentgen Rays Upon Bacteriophage, by A. I. Kendall and C. A. Colwell; Plant Growth Substances—General Survey, by W. J. Robbins; Definition of the Growth Factor of Micro-organisms [trans. title], by W. H. Schopfer; The Growth Factor Problem in *Rhizobium*, by F. E. Allison and F. W. Minor; Con-

cerning the Metabolism of Vitamin $B_1$ by *Phycomyces*, by J. Bonner; Molybdenum and Calcium in *Azotobacter* Nutrition, by D. Burk and C. K. Horner; The Nature of the Growth Stimulating Factors for *Rhizobium trifolii*, by P. W. Wilson and P. M. West; Relation of Accessory Substance and Amino Requirements to the Carbon Nutrition of *Aspergillus niger*, by R. A. Steinberg; Some Effects of Carcinogenic Substances on *Saccharomyces ellipsoideus*, by C. W. Dodge; Glutamine and the Growth of Bacteria, by P. Fildes; Nonspecific Growth Factors of Aerobic Bacteria [trans. title], by J. Hirsch; Factors Affecting the Yield of Some Thiamin-Requiring Fungi, by L. H. Leonian and V. G. Lilly; Wildiers' Bios, by W. L. Miller; New Growth Factors in One-Celled Green Algae (*Chlamydomonas*) [trans. title], by F. Moewus; Growth Factor Requirements of Bacteria in the Lactic and the Butyric Groups, by W. H. Peterson, E. E. Snell, and L. E. McDaniel; The Growth Substance Demand of Different Fungi, by N. Nielsen; Growth Substances of the Lactic Acid Bacteria, by S. Orla-Jensen and A. Snog-Kjaer; Pantothenic Acid and Microorganisms, by R. J. Williams; The Nature of Lichen Symbiosis According to Present Views, [trans. title], by F. Tobler; Sexuality in the Mucorales, by E. O. Callen; The Mechanics of Fertilization in Certain Species of Discomycetes, by F. L. Drayton; Growth and Other Physiological Characteristics of Fungi Surviving Exposure to Radiation and High Temperature, by B. M. Duggar and T. F. Anderson; The Effects of Heat and Irradiation Upon *Neurospora tetrasperma*, by T. H. Goodspeed and W. S. Malloch; Field Studies on the Connection of *Botrytis* and *Sclerotinia*, by P. H. Gregory; Sexuality in the Chytridiales, by J. S. Karling; Nuclear Migration in *Gelasinospora*, by E. S. Keeping; Mutations, Chromosomes, and Crossing-over in *Neurospora crassa*, by C. C. Lindegren; Sexuality in *Pseudolpidium*, by D. A. McLarty; Sexuality in the Basidiomycetes [trans. title], by A. Quintanilha; The Variation of the Fungi, by H. I. Waterman; The Theory of Cyclic Ageing and Rejuvenation of Plants in Ontogenesis, by N. P. Krenke; Modifications Induced by the Application of Growth Substances to Seed Plants and Microorganisms, by P. W. Zimmerman; The Significance of Chitin and Cellulose in the Phylogeny of Fungi [trans. title], by R. Harder; Observations on Zoosporangia and Zoospores of the Plasmodiophorales, by G. A. Ledingham; Mycorrhizal Response to Experimental Variations in a Selected Soil, by M. C. Rayner; Discomycete Studies (*Pezicula* and *Ocellaria*) [trans. title], by H. W. Wollenweber; The Influence of Plants Upon the Soil Population, by R. L. Starkey; The Errors of the Plate Method, by N. James; Factors Affecting the Fermentation Rate of Yeast, by C. N. Frey, A. S. Schultz, and L. Atkin; Time Lapse Motion Photomicrographic Studies of Yeast Cells, by G. W. Kirby, F. Swift, and W. Schanzenbach; The Fermentation of the Native Cellulose in Wood, by A. I. Virtanen; Cucumber Pickle Fermentation Under Southern Conditions, by H. E. Goresline; Investigations on the Development of Yeast Cells (*Saccharomyces* sp.), Mechanical Equations Expressing the Development of Living Beings, and the Biophysical-Chemical Relationships, by F. Kövessi; Effect of Radioactive Substances on Fermenting Microorganisms, by R. Nakazawa and M. Simo; and On the Mechanism of Alcoholic Fermentation, by F. F. Nord.

**The enumeration of bacteria by the microscopic method**, J. H. HANKS and D. F. JAMES (*Jour. Bact., 39 (1940), No. 3, pp. 297–305, figs. 4*).—It is shown that the natural distribution of bacteria in films prepared for microscopic counting is not taken into consideration when square films are used or random observations are made. Preparation of circular films and microscopic sampling along two diameters at right angles takes into account the concentric distribution of bacteria and minimizes the effects of abnormal distribution. Obtaining of reliable counts necessitated the use of a suitable fixative, and the

amount required on a slide is noted. An attempt was made to determine the minimum number of fields to sample, and the relation between the average number of bacteria per field and the number of fields is discussed.

**Evaluation of the errors involved in estimating bacterial numbers by the plating method,** M. W. Jennison and G. P. Wadsworth (*Jour. Bact., 39 (1940), No. 4, pp. 389–397*).—"The dilution error and the distribution error are the chief sources of variation accounting for the total error involved in estimating bacterial numbers by the plating method. An expression is derived for evaluating the dilution error, deviations in pipettes and dilution blanks being known. A convenient table of dilution errors, as percentage standard deviations, is given, covering the range of dilutions ordinarily employed for all combinations of dilution blanks and for various deviations in pipettes and blanks. The usual method for estimating the distribution error is indicated, and a formula given for calculating the total error from the distribution error and the dilution error."

**The fixation of $CO_2$ by cell suspension of Propionibacterium pentosaceum,** H. G. Wood and C. H. Werkman. (Iowa Expt. Sta.). (*Biochem. Jour., 34 (1940), No. 1, pp. 7–14*).—"The dissimilation of mannitol, adonitol, erythritol, glycerol, and rhamnose under an atmosphere of $CO_2$ was accompanied by a definite uptake of $CO_2$ whereas glyceraldehyde, glucose, dihydroxyacetone, arabinose, galactose, and xylose gave a small evolution or some uptake. The evolution of $CO_2$ from lactic and pyruvic acids was much larger. Dissimilation of most of the substrates in an atmosphere of $N_2$ occurred with an evolution of $CO_2$ which was usually much larger than in an atmosphere of $CO_2$, indicating that utilization of $CO_2$ is proportional to the $CO_2$ concentration. These results suggest that the fixation of $CO_2$ may be a phenomenon of widespread occurrence. Malonate, azide, arsenite, cyanide, and pyrophosphate had no influence on $CO_2$ fixation. NaF and iodoacetate inhibit $CO_2$ utilization, but iodoacetate is not satisfactory because it suppresses the entire dissimilation. NaF increased the evolution of $CO_2$ from a number of substrates. This fact is further evidence of its utilization in their dissimilation. The concentration of NaF necessary to inhibit dissimilaton of phosphoglyceric acid was about one-half that required to inhibit utilization of $CO_2$. The reactions inhibited may not be identical in the two processes. It is probable, however, that a phosphate ester, possibly phosphopyruvic acid, is involved in the utilization of $CO_2$."

**Biological oxidation of molecular hydrogen,** S. B. Lee and W. W. Umbreit. (Univ. Wis.) (*Zentbl. Bakt. [etc.], 2. Abt., 101 (1940), No. 18–20, pp. 354–363, figs. 5*).—During experiments on the $H_2$ inhibition of symbiotic N fixation by red clover and nodule bacteria, it was found that in the presence of combined N significant vacuums occurred in the culture bottles, the sand substrate blackened, and the plants wilted and died. It is shown that the death of the plants was due to the activities of bacteria capable of oxidizing molecular $H_2$. Through the reduction of nitrates to nitrites, sulfates to sulfides, and depletion of the $O_2$ content of the cultures, the plants were killed. It was demonstrated that $CO_2$ is essential for initiation of the H-oxidizing process. Pure cultures of these bacteria capable of oxidizing molecular $H_2$ were isolated and characterized, and they were found to correspond closely to certain heterotrophic forms previously described.

**Fermentation of sugar acids by bacteria,** G. B. Robbins and K. H. Lewis. (Univ. Nebr.). (*Jour. Bact., 39 (1940), No. 4, pp. 399–404*).—"The fermentative action of 24 species of bacteria on 2 dicarboxylic and 10 monocarboxylic sugar acids, including 7 compounds not previously reported, is compared with the utilization of related aldoses and sugar alcohols. The conclusion of others that

any change from the structure of the aldose lessens the frequency of utilization is substantiated in several further instances. The usefulness of sugar acids for distinguishing between certain bacterial species is indicated as being worthy of future study. The relation of asymmetric structure to fermentation of sugar acids is not entirely proved, but indications are that total structure of the molecule conditions availability."

**The effect of some saturated fatty acids on the respiration of baker's yeast,** E. S. Cook and M. N. Morgan (*Biochem. Jour., 34 (1940), No. 1, pp. 15–20, figs. 3*).—"The addition of nontoxic concentrations of saturated fatty acids to suspensions of baker's yeast causes an increase in $O_2$ uptake. The magnitude of the effect depends upon both the concentration of the acid and its molecular weight. Within limits (valeric to undecoic) the physiological effects, as determined by toxicity and respiratory activity, generally appear to increase with lengthening of the carbon chain, but a lowering of activity is evident with stearic acid. Measurements of the respiratory quotient and qualitative tests for the presence of ketone bodies suggest that the respiratory activity may be due at least in part to the oxidation of the fatty acids by the yeast."

## GENETICS

**The genotypic basis of sex-expression in angiosperms,** C. E. Allen. (Univ. Wis.). (*Bot. Rev., 6 (1940), No. 6, pp. 227–300*).—Following an introductory section, the author presents his critical, analytical review (over 10 pages of references) under the following headings: Experimental studies of dioecious species, sex chromosomes in dioecious species (allosomes in secondary hermaphrodites, allosomes and heteroploidy, allosomes and hybridity, origin of sex chromosomes, differences between microgametophytes, and sex-linked inheritance), experimental studies of plants of other categories (gynodioecious species, species displaying monoecism and related conditions, and hermaphroditic species), and the mechanism of sex determination.

**A study of methods in barley breeding,** H. V. Harlan, M. L. Martini, and H. Stevens (*U. S. Dept. Agr., Tech. Bul. 720 (1940), pp. 26, figs. 5*).—A total of 379 barley crosses (among 28 carefully chosen parent varieties) were grown at Aberdeen, Idaho, for 7 generations in separate rows in which their identities were maintained, and equal quantities of seed of these 379 crosses were mixed in the $F_2$ generation and grown in a field plat as a composite lot through the seventh generation in 1934. In 1935, 1 acre was space-planted, half being seeded to pedigree crosses and half to the 1934 composite, and an equal number of selections (2,921) was made from each lot. In 1936 the selections were grown in effectively random order and compared in yield.

The best parents for Aberdeen conditions came from north Africa and Armenia, and fair varieties were found from the Balkans, southern Union of Soviet Socialist Republics, India, and China, whereas barleys from northern Europe and Manchuria were not promising. Included among the best parents were Atlas, Minia, Trebi, Club Mariout, Arequipa, Sandrel, Flynn, Maison Carré, Algerian, Good Delta, California Mariout, and Han River. Barley varieties grown commercially in the United States usually had too many characters suited specifically to their localities to be highly useful as parents in a distinctly different area. Some varieties not quite equal to the best ones in plat tests proved to be highly desirable parents, and Minia and Good Delta varieties not promising enough in nursery tests to be grown in plats were found to be superior parents. Hybrids from crosses of six-rowed×two-rowed barleys were inferior in yield during the seven generations they were carried in bulk,

and were likewise responsible for very few high-yielding segregates among selections made in the eighth generation.

Yields of pedigree crosses before selections proved a sound indication of crosses from which high-yielding segregates might be expected, and the low-yielding crosses could have been discarded on the basis of their preselection yields without loss. Growing a number of crosses in a composite mixture was apparently equal to the method of pedigree cultures. Study of a number of plant characters with the hope of discovering the most desirable plant type indicated superficially that the ideal plant at Aberdeen is 90 cm. high, flowers between June 5 and 13, and that it is six-rowed, rough-awned, covered, and blue in color.

**Two cases of haplo-lethal deficiency in Ustilago bullata operative against saprophytism,** G. W. FISCHER. (U. S. D. A. and Wash. Expt. Sta.). (*Mycologia, 32 (1940), No. 3, pp. 275–289, figs. 4*).—Five collections of *U. bullata* on *Agropyron, Bromus, Elymus,* and *Festuca* species were found to possess a haplolethal deficiency preventing saprophytic development. About half of the sporidia from any one promycelium developed, when isolated, into typical sporidial colonies, while the others budded several times and then gradually underwent complete lysis. In four of the five collections this lethal appeared to be definitely sex-linked, 42 pedigreed monosporidial isolates of these four collections proving to be all of the same sex phase, while the fifth possessed a lethal which was segregated independently of sex factors. Twenty-nine pedigreed monosporidial isolates of the five collections of *U. bullata* with the lethal were paired with 22 such isolates from *U. nigra, U. hordei, U. levis,* and *U. avenae* and collections of *U. bullata* not possessing it. Both sexes were represented in these 22 isolates, and when paired with them the 29 isolates from collections possessing the character gave the same reaction as when paired with each other. Thus, in the four collections with sex-linked lethal, the 23 isolates representing these collections were all of the same sex, not only with reference to each other, but also with reference to the 22 isolates of other collections and other species. These haplolethal deficiencies operated only against saprophytic development. When chlamydospores of two of the collections were used as inoculum, high percentages of infection were obtained, indicating that both sexes operate toward parasitic development—both being necessary for infection. Since the lethals were exhibited by about half of the sporidia borne on any given promycelium, it is believed that they are probably borne on odd chromosomes, in one case sex-linked and in the other not.

**Production and rate of mutation in Phytomonas stewartii by X-radiation,** R. E. LINCOLN. (Iowa State Col. and Cornell Univ.). (*Genetics, 25 (1940), No. 1, pp. 125, 126*).—An abstract.

**Studies of sterility in Argentinian corn** [trans. title], E. GINI (*An. Inst. Fitotec. Santa Catalina, 1 (1939), pp. 135–158, figs. 3; Eng. abs., p. 157*).—The author presents the results of a genetic and cytological study of the factors involved in male sterility of local strains of corn. Among 19 families exhibiting this condition, 9 owed their sterility to Mendelian factors, in 6 it was due to cytoplasmic inheritance, and in 4 the cause was undetermined. The genetic constitution of several recessives is given. Sterility due to genetic factors was found to be more widely distributed than that due to cytoplasmic factors.

**A study of the character "siamensis" in corn (Zea mays)** [trans. title], M. E. SANGUINETI (*An Inst. Fitotec. Santa Catalina, 1 (1939), pp. 17–134, figs. 13; Eng. abs., pp. 133, 134*).—Duplications of embryos in local Argentinian varieties of corn were found to affect the coleoptile, plumule, coleorhiza, primary root, mesocotyl, and secondary roots in all possible combinations. Not only

double, but also triple, quadruple, quintuple, and sextuple parts were found. All plants grown from the same seed were always of identical constitution, having the same number of chromosomes and in all cases being diploids. The gene responsible for these duplications is apparently recessive, and is designated siamensis. Linkage studies with other genes seem to indicate that it is located in chromosome 6. According to the segregations obtained from selfing siamensis plants it is inferred that this gene is modified by other factors, some of which are dominant.

**Hybridization of American 26-chromosome and Asiatic 13-chromosome species of Gossypium,** J. O. Beasley. (U. S. D. A. and N. C. Expt. Sta.). (*Jour. Agr. Res* [*U. S.*], *60* (*1940*), *No. 3, pp. 175–181, fig. 1*).—Study of pollen germination, pollen-tube growth, fertilization, and the embryology of the cotton hybrids revealed that in reciprocal crosses of American 26-chromosome × Asiatic 13-chromosome cottons the pollen germinates and pollen tubes enter more than half the embryo sacs. Embryo and endosperm development is initiated, but soon becomes aberrant. Use of the American 26-chromosome type as female and a few grains of pollen from a 26-chromosome type along with excess Asiatic 13-chromosome pollen resulted in minute hybrid seeds. Plants could be produced from them by germination on sterile culture media. Hybrids involving six combinations of American 26-chromosome × Asiatic 13-chromosome cottons were produced.

**Production of new wheat varieties at the Phytotechnical Institute of Santa Catalina** [trans. title], J. G. Arzuaga (*An. Inst. Fitotec. Santa Catalina, 1* (*1939*), *pp. 9–15, figs. 2; Eng. abs., p. 15*).—Details are given regarding the disease resistance, yield, and quality of crosses of Chino 166 × Lin Calel, Heines Kolben × 38 M. A., Ardito × Lin Calel, and Riccio × Lin Calel wheat varieties.

**Cytology of parthenogenesis in Poa pratensis,** F. W. Tinney. (Wis. Expt. Sta.. and U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *60* (*1940*), *No. 5, pp. 351–360, pls. 4*).—Seed of *P. pratensis* collected from old permanent pastures in Wisconsin was grown in single clones in the greenhouse and in the field. The single macrospore mother cell underwent meiosis in the usual manner in the biotypes studied and formed haploid macrospores, usually three, since the second meiotic division was often incomplete, but in all cases observed the three or four macrospores so formed disintegrated. Indications were that practically all the plants grown from seeds collected from a single plant are alike in growth form and habit. Since the embryo sac develops from a vegetative cell of the nucellus without meiosis, its origin may be considered an instance of apospory. The embryo develops from the egg by parthenogenesis. Diploid parthenogenesis and occasional fertilization of the egg by a sperm possessing a varied chromosome number can produce the singular characteristics of *P. pratensis*, i. e., extreme polymorphism and varying euploid and aneuploid chromosome numbers of different biotypes, and constant morphological type and chromosome number in plants of the same biotype. Two embryos are occasionally produced by the functioning of two embryo sacs, and each embryo sac seems to develop independently from separate somatic cells of the nucellus. There was no evidence that embryos arise by sporophytic budding from the nucellus.

**Cytotaxonomic studies in the Gramineae Spartina, Andropogon, and Panicum,** G. L. Church (*Amer. Jour. Bot., 27* (*1940*), *No. 4, pp. 263–271, figs. 33*).—The somatic chromosome numbers are presented for 9 species and 4 varieties of *Spartina*, 9 species and 8 varieties of *Andropogon*, and 3 varieties of *Panicum*. Intraspecific polyploidy is described in 3 *Spartina* species. *S. patens* is tetra-

ploid, the northern variety *juncea* is hexaploid, and the southern variety *juncea* is octoploid. *S. alterniflora* of the strand is octoploid, and the taller variety of tidal lagoons is decaploid, *S. pectinata* of the Atlantic coast is hexaploid, and the material from the western United States is dodecaploid. The varieties studied of *A. virginicus* of the Atlantic Coastal Plain, including *A. glomeratus*, are diploid. Similarly, the varieties of *A. scoparius*, including *A. littoralis*, are tetraploid. Recent taxonomic treatments of these "species complexes" harmonize with the cytological data obtained. Tetraploid and hexaploid morphologically distinct forms of *A. provincialis* are reported. A large, ascending, decaploid form of *A. saccharoides* is described. An Atlantic coast tetraploid variety of *P. virgatum* is contrasted with western tetraploid and octoploid forms. Cytological data and citation of herbarium specimens concerned in this study are tabulated.

**A cytological study of some species in the genus Paspalum,** G. W. BURTON. (U. S. D. A. and Ga. Expt. and Coastal Plain Stas.). (*Jour. Agr. Res.* [*U. S.*], *60* (*1940*), *No. 3, pp. 193–197, figs. 2*).—Counts of somatic chromosomes in root tips of *Paspalum* spp. indicated that with evidence that 10 is the basic (*n*) number of chromosomes, the 12 *Paspalum* spp. considered fall into a polyploid series ranging from 2*n* to 16*n*. The group comprises *P. ciliatifolium, P. paniculatum, P. stoloniferum,* and *P. pubescens,* diploids; *P. dilatatum, P. notatum, P. malacophyllum, P. urvillei, P. boscianum,* and *P. scrobiculatum,* tetraploids; *P virgatum,* octoploid; *and P. floridanum,* sixteenploid. The most promising pasture species are tetraploids. A rather close correlation was observed between calculated areas of equatorial plates and their chromosome numbers.

**The chromosome complement of Bumelia lanuginosa and its phylogenetic significance,** W. L. BROWN and R. B. CLARK (*Amer. Jour. Bot.*, *27* (*1940*), *No. 4, pp. 237, 238, fig. 1*).—In connection with a monographic and horticultural study of the genus, the authors found the somatic chromosome number of *B. lanuginosa* to be 24. Since this appears to be the first count reported for the Sapotaceae, the relationships of that family are discussed in the light of this information, which favors the view that the Sapotaceae are more closely allied to the Styracaceae than to the Ebenaceae.

**Colchicine-induced variations in petunia** [trans. title], J. T. PERAK (*An. Inst. Fitotec. Santa Catalina, 1* (*1939*), *pp. 167–173, figs. 3; Eng. abs., p. 173*).—Colchicine-treated plants proved to be polyploids, with larger stomata, broader leaves, and larger pollen grains. In the first metaphase of pollen mother cells, 28 chromosomes (2*n*=28) were counted, and in plants with roughened leaves diploid and tetraploid cells were observed, denoting their mixoploid nature.

**Obtaining polyploid petunias by colchicine treatment** [trans. title], E. A. GRANER (*Jor. Agron., 3* (*1940*), *No. 1, pp. 43–68, pls. 7; Eng. abs., p. 65*).—Of four methods of treatment used, the best results were obtained by seed treatment and by drops on the apical buds of seedlings. Eight tetraploids were obtained and are described. No positive correlation was found between chromosome duplication and pollen grain size, morphological changes, thickness of leaves, etc., these tetraploids being separated only on a cytological basis. The two octoploids obtained were morphologically very similar. Special note is made of the fact that colchicine not only induced regular duplications of the chromosomes, but other alterations such as chimeras, gene mutations, and aneuploidy.

**Variations induced in Salvia splendens by the action of colchicine** [trans. title], B. SCHNACK (*An. Inst. Fitotec. Santa Catalina, 1* (*1939*), *pp. 175–180, figs. 2; Eng. abs., p. 180*).—Among the treated plants there was one considered to be tetraploid on account of the increase in stomatal size, increase in size of

*pollen grains and more or less irregularity in their size and shape,* modification of the ratio of length to breadth of leaf peculiar to polyploids, increase in flower size, modification of the length of the style in relation to the corolla, and greater compactness in the inflorescences.

**Inheritance in the cucumber, A. E. Hutchins.** (Minn. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *60* (*1940*), *No. 2, pp. 117–128, fig. 1*).—In a cross between parents differing from each other in height, growth habit, spine characters, and mature fruit color and netting there was recorded the inheritance of the various characters and different associations between characters as shown in the progeny. The inheritance of the following differential characters was expressed on the assumption of a single-factor difference: Determinate growth habit v. indeterminate; black spines v. white; coarse spines v. fine; few spines v. numerous; mature fruit netting v. slight or no netting; tall plant v. short or dwarf. Fruit color was apparently due to the interaction of two independently inherited factors. The factor responsible for the determinate growth tended to decrease the height of the plant. Certain characters were found associated in complete linkage or possibly as an expression of the same factor. For example, determinate growth habit appeared associated with a short plant, small number of mature fruits, small yield and small individual weight of mature fruits, greater number of days to the first female flower, short laterals, and certain other characters. Large fruit size appeared to be associated with white spines, coarse spines, few spines, no netting, and cream-colored fruit.

Certain associations were observed in the $F_2$ progeny, such as a negative correlation between the number of days to the production of the first female flower and total production of the plant and a positive but not significant correlation between the number of days to the first male flower and total production. A high degree of association was found between the time of the production of the first female flower and the maturity of the fruit.

**Variations observed in the fruit of a pumpkin crop (Cucurbita pepo)** [trans. title], H. G. Contardi (*An. Inst. Fitotec. Santa Catalina, 1* (*1939*), *pp. 187–199, figs. 5; Eng. abs., p. 199*).—This is a summary of the variations in a pumpkin population preliminary to initiation of breeding work, and including the following fruit characters: General form, dimensions and weight, external color, peduncle characters, external warts, lobules, number of carpels and variations in the locular cavity, color and taste of pulp, color of seed, and hardness of pericarp.

**A genetic study of saucer fruit shape and other characters in the peach, J. W. Lesley.** (Calif. Citrus Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 36* (*1939*), *pp. 218–222*).—Based on observations of a large number of seedlings and on data recorded by earlier workers, reports are given that the gene for saucer fruit shape (*S*) is completely dominant to nonsaucer gene (*s*). Evidence from a few small families is suggestive of an association between saucer shape and early maturity, possibly due to genetic linkage, and between saucer shape and small size, which may be due to the inhibiting effect of the *S* gene on fruit size. The Peento, a saucer variety, is a useful parent in breeding varieties adapted to a subtropical climate, but saucer varieties should not be chosen as ♀ parents owing to the low viability of saucer seeds when afterripened in the ordinary way.

**The modern science of heredity and its application to animal breeding, B. Maymone** (*18. Internatl. Cong. Agr., Dresden, 1939, Sect. 6, Main Rpts., pp. 37–44*).—Popular and general accounts are given of possibilities of genetics for the breeding and improvement of livestock.

**On the possibilities of giving impetus to cattle-breeding** [trans. title], T. TERHO ([*Finland*] *Valtion Maatalouskoet. Julkaisu.* (*Agr. Expt. Activ. State Pub.*), *No. 106* (*1939*), *pp. 69+14; Eng. abs., pp. 62–69*).—Study is reported of the use of the best five lactation months as an indication of the dams' and daughters' milk and fat production. These results were based on records of Finnish cattle in cow testing associations.

***Somatic mosaics in the domestic pigeon***, W. F. HOLLANDER and L. J. COLE. (Wis. Expt. Sta.). (*Genetics, 25* (*1940*), *No. 1, pp. 16–40, figs. 15*).—"Flecking" in the pigeon is described as of three types associated with the sex-linked color genes $B^{St}$ (almond), $B^A$ (ash-red), $B^{Of}$ (faded), $B$ (wild type), and $b$ (chocolate). An autosomal factor, grizzle, was associated with flecks of recessive color. Chimeras, involving ash-red, chocolate, dilution, grizzle, recessive red, "spread black," and silky, some of which were previously noted (E. S. R., 82, p. 321), showed that the areas discordant with the regular phenotype were commonly larger than the flecks and could include one whole side. The chimeras were most frequently observed in heterozygotes. Somatic mutations of a recessive nature served as the most ready explanation in many cases, but dominant mutations or possibly polyspermy involving at least two color effects and pigment arrangements were noted.

**The physiology of cold blackening in Russian rabbits.—IV, Information on the ferment production by the separated gene $a_n$** [trans. title], R. DANNEEL and H. PAUL (*Biol. Zentbl., 60* (*1940*), *No. 1–2, pp. 79–85, fig. 1*).—In continuation of this series (E. S. R., 80, p. 607), study was made of the pigmentation of frozen sections of the skin of $a_na$ and $a_na_n$ rabbits. Although controls kept at 37° C. remained white, those from $a_na_n$ rabbits kept for 40 min. or longer in a nitrogen atmosphere at 25° showed a dopa reaction. With skin from $a_na$ rabbits a dopa reaction was obtained after 50 min., but the reaction was weaker than that from $a_na_n$ rabbits. The amount of oxidizing ferment freed by the cooling thus seemed related to the presence of one or two $a_n$ genes.

**Studies on the creeper fowl.—XIII, The effect of selenium and the asymmetry of selenium-induced malformations**, W. LANDAUER. ([Conn.] Storrs Expt. Sta.). (*Jour. Expt. Zool., 83* (*1940*), *No. 3, pp. 431–443*).—Because of the fundamentally similar mechanisms operating in the creeper fowl malformations (E. S. R., 82, p. 757) and selenium terata, eggs from heterozygous and normal hens mated to Leghorn cocks, all of which were fed on rations containing selenium, were incubated for a comparison of the types of abnormalities and mortality and the age at which they occur. Although over 2,000 fertile eggs were incubated, only 2 hatched. The mortality was heavier up to the eighteenth day of incubation in eggs from heterozygous creepers than in the eggs from normals. However, after the eighteenth day the mortality was about 80 percent in the fertile eggs from normal hens and less than 70 percent in the eggs from heterozygous creepers. Classification by type of abnormality showed that extreme malformations were more prevalent in embryos from heterozygous hens than from normals. The creeper mutation was found to exaggerate the defects produced by selenium. Asymmetry in the selenium abnormalities was noted.

**The use of the median as a measure of sexual maturity in White Leghorn pullets**, I. M. LERNER and L. W. TAYLOR. (Univ. Calif.). (*Poultry Sci., 19* (*1940*), *No. 3, pp. 216–218, fig. 1*).—In observations made on the sexual maturity of 278 Single-Comb White Leghorn pullets hatched from 12 sires in 1935 and 330 from 14 sires in 1936, the median age at first egg proved as efficient a measure of sexual maturity of a family as the mean age at first egg.

Correlations above +0.9 were found between mean maturity and median maturity. Correlation coefficients of —0.46 were found between mean maturity and annual production in 1935 and —0.47 between median maturity and production in the same year. Similar but lower correlations were obtained in 1936.

**Observations on the sexual behavior of New Hampshire males,** J. E. Parker, F. F. McKenzie, and H. L. Kempster. (Mo. Expt. Sta. and U. S. D. A.). (*Poultry Sci., 19 (1940), No. 3, pp. 191–197, figs. 2*).—Study was made of the sexual behavior of New Hampshire cockerels in breeding pens and in batteries and permitted to mate at different times of the day. Semen samples were collected, in the main, by methods described by Parker (E. S. R., 82, p. 324). During a 15-min. test interval after a rest period there were performed an average of 1.26 copulations, with a collection of 0.3 cc. of semen containing an average of 2,340,000 spermatozoa per cubic millimeter. In successive ejaculations the number of sperm and the volume of semen were reduced. The ♂♂ were more active sexually in the late afternoon than in the morning.

**A note on the use of short-time trapnesting in breeding selection,** I. M. Lerner and L. W. Taylor. (Univ. Calif.). (*Poultry Sci., 19 (1940), No. 3, pp. 187–190*).—An analysis was made of the egg production records of 1,303 Single-Comb White Leghorns in comparison with records of their dams and their dams' sisters for the year and by the 3 mo., November, December, and January, singly and collectively. The results showed the dams' records alone for the winter months or for the year to be of little or no value in the selection of daughters for breeding, but an index based on the dams' sisters' production was useful in indicating the daughters' production. Trap nesting for the whole year was not more efficient as an indication of the total eggs laid than trap nesting for the winter months only. Other factors, such as maturity, pauses, broodiness, and persistency, should be observed if the short-time trap nesting is to be employed as an indication of the transmission of desired production.

**Rôle of inborn resistance factors in mouse populations infected with Bacillus enteritidis,** L. T. Webster and H. L. Hodes (*Jour. Expt. Med., 70 (1939), No. 2, pp. 193–208, figs. 3*).—Four strains of mice differing in their susceptibility to mouse typhoid were found to continue to exhibit differences in their susceptibility under natural infection. These results indicated that the resistance seemed to be hereditary, even under such adverse conditions as crowding.

***Familial mammary tumors in the rabbit.—III, Factors concerned in* their genesis and development,** H. S. N. Greene (*Jour. Expt. Med., 70 (1939), No. 2, pp. 167–184, pls. 2*).—The breeding history of two types of mammary tumors in rabbits showed them to be determined as to type and incidence by heredity. Information on the mode of inheritance was contradictory. There were cases of mother-to-daughter transmission for two or three successive generations. Expression of the tendency appeared in reciprocal crosses with tumor-free lines to be recessive and occasionally dominant. Breeding performance and litter size were irregular during the period preceding the mammary changes. Mortality and resorptions were prevalent among the young when disorders appeared in the dams, but the tumors did not seem to be transmitted in the milk supply. Endocrine imbalance similar to that found after long periods of administration of oestrogens was noted in tumor-bearing rabbits.

**The action of some androgenic substances on the immature female rat and guinea-pig,** J. R. Groome (*Quart. Jour. Expt. Physiol. and Cog. Med. Sci., 29 (1939), No. 4, pp. 367–377, fig. 1*).—Twelve 46-day-old ♀ rats were selected for a study of the effects of eight daily injections of 500γ of testosterone propionate on half of them. All were sacrificed at 55 days of age and showed an abnormal increase in body weight and hypertrophy of the uterus, preputial gland,

and clitorislike organ. In general, mammary development did not occur. Studies with guinea pigs showed that similar results were obtained on grafting testicular tissue and testosterone implants in ovariectomized animals.

**Prolificacy of rats treated with mare gonadotropic hormone,** H. H. Cole (Univ. Calif.). (*Science, 91 (1940), No. 2366, pp. 436, 437*).—After administration of 8 rat units of mare gonadotropic hormones in a single injection to rats ranging from 30 to 33 days old, 30, 32, and 33 fetuses, respectively, were found in 3 litters at midpregnancy. More than 20 living embryos were found on the twenty-first day of gestation, and as many as 23 were born alive, suggesting that the number of viable young carried to term may be increased by the treatment of immature ♀ ♀ with mare gonadotropic hormone.

**Precocious copulatory activity induced in male rats by subcutaneous injections of testosterone propionate,** C. P. Stone (*Endocrinology, 26 (1940), No. 3, pp. 511–515, figs. 2*).—The daily administration of 0.62 mg. of testosterone propionate to ♂ rats after 22 and 26 days of age in different groups caused a precocious copulatory response similar to that exhibited by normal ♂ ♂ but about 20 days earlier than in the controls.

**Prolonged administration of sex hormones to castrated rats,** V. Korenchevsky, K. Hall, and M. A. Ross (*Biochem. Jour., 33 (1939), No. 2, pp. 213–222*).—Studies were made of the effect of the administration for an average of 105 days of oestradiol dipropionate and androsterone, dehydroandrosterone, testosterone, and testosterone propionate, alone and in combination with oestradiol dipropionate, on the body weights and organs of castrated rats. Testosterone and oestradiol dipropionate showed a strong cooperative activity, but an antagonistic effect was unexpectedly obtained when androsterone and dehydroandrosterone were injected simultaneously with oestradiol dipropionate. Testosterone propionate was the only hormone which produced complete restoration of the sexual glands and prevented the tumorlike hyperplasia of the hypophysis caused by oestrogens.

**Further investigations concerning the effects of formalin on the gonadotropic and thyroid-stimulating hormones of cattle anterior pituitary glands in the guinea pig,** L. Loeb and S. J. Hayward (*Amer. Jour. Physiol., 127 (1939), No. 3, pp. 497–504*).—Further studies (E. S. R., 81, p. 199) showed that immersion of cattle pituitary glands in 0.25-percent formalin solutions at pH 5 for 7 days caused a reduction or complete suppression in luteinizing and atresic effects, with full maturation of the follicles and heat changes in guinea pigs in which they were implanted. Negative results were produced by too-strong solutions of formalin, which led to the destruction of the gonadotropic hormone. It was possible to preserve the follicle-stimulating function of the glands modified by the formalin treatment by immersion in glycerin for at least 4 mo. The thyrotropic hormone was destroyed by the formalin treatment.

***Experimental intersexuality: The effect of antenatal androgens on sexual* development of female rats,** R. R. Greene, M. W. Burrill, and A. C. Ivy (*Amer. Jour. Anat., 65 (1939), No. 3, pp. 415–469, pls. 7*).—In continuation of earlier studies (E. S. R., 80, p. 35), the administration of crystalline testosterone, testosterone propionate, androsterone dehydroandrosterone, and androstenedione in peanut oil, a solution of alcohol and propylene glycol, or as pellets subcutaneously implanted into pregnant ♀ rats was found to cause intersexuality in many of the young. The androgens were administered in daily doses from 4 to 8 days or by single large doses. With small doses before the eighteenth day of pregnancy delivery was normal, but parturition was delayed and the percentage of resorptions increased with larger doses. It was difficult to raise the young subjected to heavy doses and removed from the uteri on the twenty-second day of age. Both ♂ and ♀ sex structures existed in the intersexes, which were ex-

ternally indistinguishable at birth from the ♂ littermates. Internally the changes in the intersexed animals differed in degree, according to the dose of androgen and the time of treatment in both newborn and adult embryos. Large doses of hormone administered early in pregnancy caused a maximum degree of masculinization.

**The rôle of sex, estrogenic hormone, fasting, and diuresis in the response of crop-sacs of pigeons to prolactin,** R. W. Bates, O. Riddle, and E. L. Lahr (*Amer. Jour. Physiol., 127 (1939), No. 3, pp. 422–429*).—Employing 6-week-old White Carneau squabs, the authors found that intramuscular injections of 0.4 cc. of prolactin on four successive days produced no significant sex difference in the crop-sac weight, but with subcutaneous injections the responses were greater and the ♂♂ usually showed a greater response than ♀♀. When 10 mg. of dihydro-oestrone was administered simultaneously with the prolactin in subcutaneous doses, response in the crop gland was reduced by about 80 percent. Massive doses of dihydro-oestrone, accompanied by both diuresis and diminished food intake, reduced the response to from 15 to 25 percent of that of normal untreated pigeons.

**Postnatal development of reproductive system in male guinea pigs and its relation to testis hormone secretion,** E. D. Sayles (*Physiol. Zool., 12 (1939), No. 3, pp. 256–267, fig. 1*).—Data are reported on the body and reproductive gland weights of 73 guinea pigs from 9 to 130 days of age, together with a study of histological changes in the glands and the function of the reproductive organs. These results showed that the spermatozoa appeared in the testes at about 50 days, and ejaculation of spermatozoa could be induced electrically a few days later. Prepuberal castration exerted little modification in the prostate and seminal vesicles.

**The effect of testosterone propionate on the early development of the reproductive ducts in the female sparrow hawk (Falco sparverius sparverius),** O. E. Nelsen and R. B. Stabler (*Jour. Morphol., 66 (1940), No. 2, pp. 277–297, pls. 4*).—The injection of young ♀ sparrow hawks with testosterone propionate caused both sets of reproductive ducts (oviducts and Wolffian ducts) to develop synchronously. The androgen supersedes the normal genetic ♀ effect and produces a hermaphroditic tendency. There was little or no effect on the ovaries.

**Androgenic function of APL stimulated ovaries in immature rats,** R. R. Greene and M. W. Burrill (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 3, pp. 761–764*).—Male ventral prostates were implanted in immature ♀ rats 10 days of age, and from 25 to 100 rat units of chorionic gonadotropin were administered daily for from 5 to 28 days later. An enlargement of the clitoris, which was evidently due to androgen production by the ovaries, did not occur in ovariectomized ♀♀. The prostates of the treated animals showed no evidence of stimulation after 28 days.

**The effects of theelin administration upon the reproductive system of the female English sparrow, Passer domesticus (Linnaeus),** A. R. Ringoen. (Univ. Minn.). (*Jour. Expt. Zool., 83 (1940), No. 3, pp. 379–389, pls. 2*).—In further studies on the sexual cycle of English sparrows (E. S. R., 81, p. 358), the daily intramuscular injection of juvenile birds with 100 International Units of theelin for from 9 to 22 days in October and November caused pronounced and consistent hypertrophy of the oviducts of the experimental ♀♀. The gonads showed no significant enlargement. Birds injected in January and February showed inhibition of the follicular apparatus as compared with the controls, presumably due to an involvement of the hypophysis.

**The comparative action of graded doses of International Standard gonadotropic substance (chorionic gonadotrophin) on normal infantile male and female rats,** J. L. SEALEY and C. W. SONDERN (*Endocrinology, 26 (1940), No. 5, pp. 813–820, figs. 5*).—Study of changes in the weights of the uterus, ovaries, and seminal vesicles and in gross signs of luteinization and vaginal oestrus of immature ♂ and ♀ rats as a result of doses of gonadotropic substances showed significant responses to total doses of 0.5–10 International Units given over a period of 5 days. Seminal vesicle weight was stimulated by doses as low as 1.0 I. U., and there was increased response to larger doses. Uterine weight changes followed increases in the dose up to about 2.0, after which there was little if any increase, although ovarian weight showed an increase up to and including doses of 8 I. U. Similarity in response of ovaries and uteri to anterior pituitary and pregnant-mare serum was noted.

**Some observations on artificial breeding,** R. E. HORWOOD, C. L. COLE, and E. S. SMILEY (*Michigan Sta. Quart. Bul., 22 (1940), No. 4, pp. 236, 237*).—General results from the application of artificial insemination in different organizations of dairy cattle breeders are presented.

## FIELD CROPS

**[Field crops experiments in Hawaii],** J. C. RIPPERTON, E. Y. HOSAKA, R. A. LYMAN, M. TAKAHASHI, J. E. WELCH, D. SUMIDA, H. D. MICHENER, H. F. CLEMENTS, and E. K. AKAMINE (*Hawaii Sta. Rpt. 1939, pp. 9–19, 20, 21, 21–25, 45, 46, 75–77, figs. 4*).—Agronomic research (E. S. R., 81, p. 638), again reported briefly, included breeding, variety, cultural, and dormancy studies with potatoes; variety tests with sweetpotatoes and taro; a fertilizer test with taro; cutting and strain tests with Napier grass; germination experiments with sugarcane buds and grass seeds; effects of animal digestion upon germination of seed of koa haole (*Leucaena glauca*); response of legumes to inoculation; a vegetational survey of pasture areas; and adaptation studies with grasses and legumes.

**[Field crops research in Kentucky]** (*Kentucky Sta. Rpt. 1939, pt. 1, pp. 13–16, 33–35, 39, 42, 43, 57*).—Accounts of progress are made from field crops studies (E. S. R., 81, p. 501), including variety tests with corn, alfalfa, and red clover; breeding work with corn and corn hybrids, red clover, and bluegrass; fertilizer and curing experiments with tobacco; the effect of soil nitrate level on yield and quality and effect of certain tillage practices on yield, both with Burley tobacco; a study of level of replaceable potassium and growth of tobacco; pasture experiments concerned with effects of top dressings with superphosphate and effects of legumes on bluegrass in mixtures; residual effects of limestone on yields of corn, wheat, and hay in rotation; and the effects of certain cropping systems on soil nitrogen content.

**[Farm crops research in Mississippi]** (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), Nos. 4, pp. 1, 2, 3–6, 7, 8, fig. 1; 5, pp. 1, 2, 8*).—These numbers include the following reports of progress:

*No. 4.*—Harvesting the Clover Seed Crop, by H. W. Bennett (pp. 1, 7); Early Planting Essential to High Yields of Soybeans, by J. F. O'Kelly (p. 1); Corn Production in the Delta, by R. Kuykendall (p. 2); Fertilizers for Cotton Production, by W. B. Andrews (pp. 3–6); and Outlying and Station Uniform Cotton Variety Test, by H. A. York (p. 8).

*No. 5.*—Maximum Yields of Cotton With Four-Ton Manure Application, by J. C. Robert (pp. 1, 2); Tall Growing Sorghum Varieties Best for Silage Tonnage, Lesser Yielding Ones Have Advantages Often Important, by H. W. Bennett (p. 8); and Brown Loam Soils Respond to Use of Winter Legumes, by J. Pitner (p. 8).

[**Agronomic research in Ohio**] (*Ohio Sta. Bul. 600 (1939), pp. 8, 9, 10–17, 18, 19, 44, 67, 68, figs. 9*).—Results are reported from agronomic research (E. S. R., 79, p. 618) on soil structure required for sugar beets; effects of weather on returns from top dressing wheat; increase of alfalfa and mixed seedings due to lime; small response of soybeans to fertilizers; value of soybean meals as grass fertilizer; lower wheat yields following combined soybeans; higher yields from late soybean varieties; expansion of the corn hybrid program; rates at which corn hybrids grow; breeding corn with stronger roots; merits of Thorne wheat, outstanding in 1938; disease-resistant varieties of sweetclover; productiveness of mixed alfalfa-clover-timothy seedings; early seeding of legumes in wheat; effects of combine on meadow seedings; adaptation of different red clovers in northern and southern Ohio; failure of foreign clovers in 1938; Ladino, a promising strain of white clover; an experiment on all-season grazing; content of white clover in pasture as affected by management; tests of Sinox for lawn weed control and of chloropicrin for killing weed seed in soil; and increase of potato yields by special rotations.

Noteworthy on district and county experimental farms were the greater yields of potatoes and tobacco on land long in grass compared with yields on well-cropped land, greater returns from investment in limestone and fertilizer when clover-alfalfa-timothy meadow is left down for 2 or 3 yr., indications that on many dairy farms from two-fifths to one-half of the rotated area in meadows would provide hay enough to fill the mows, perhaps even a silo, and also furnish the rotated pasture needed to supplement white clover and bluegrass during the critical periods of summer and fall, growing alfalfa or sweetclover in permanent bluegrass pastures, beneficial results obtained from keeping alfalfa and grass mixtures in rotation for 2 yr. or longer, and the compensation of lower returns from corn acreages reduced by increased meadow area by growing superior hybrids and putting a larger proportion of the acreage in the silo.

[**Field crops research in South Carolina**], G. B. Killinger, H. P. Cooper, W. R. Paden, R. W. Wallace, R. L. Smith, C. S. Patrick, G. B. Nutt, J. B. Richardson, E. E. Hall, G. M. Armstrong, C. C. Bennett, B. S. Hawkins, E. D. Kyzer, J. E. Love, W. H. Jenkins, F. M. Harrell, J. R. Mattison, J. O. Ware, J. D. McCown, N. McKaig, Jr., W. A. Carns, A. B. Bowen, E. M. Roller, L. E. Scott, W. C. Barnes, and J. M. Jenkins, Jr. (Partly coop. U. S. D. A.). (*South Carolina Sta. Rpt. 1939, pp. 27–37, 43–45, 71, 72, 96–99, 106–124, 134–136, 137, 140–142, 147–160, 167, 167–173, 174, 175, 181, 182, 183, figs. 3*).—Brief reports of progress (E. S. R., 81, p. 36) are made from crops experiments at the station and substations, including variety tests with cotton, corn, oats, wheat, grain sorghum, sorgo, soybeans, potatoes, castor-beans, and pasture grasses; breeding work with cotton and potatoes; genetic studies with cotton also concerned with inheritance of *Fusarium* wilt, hybrid vigor in crosses with upland cotton and sea-island and Egyptian cotton, and leaf area, fuzz, lint, and seed relationships; fertilizer experiments with potatoes, sweetpotatoes, and soybeans; yield of potatoes as influenced by applications of manganese, magnesium, and phosphorus to limed and unlimed soil and as affected by deficiencies of magnesium and manganese; fertilizer and nutrition studies with cotton dealing with placement, time and rate of applying potassium and other fertilizers, nitrogen and potassium carriers with and without lime and magnesium carriers, and effect of different sources of nitrogen on the pH of the soil of cotton plats; the comparative value of a cover crop of rye and hairy vetch, fresh manure, and their combination in production of cotton; cottonseed germination with different fertilizer placements; studies of variation in fiber

characters in several lines of a wilt-resistant cotton; tobacco experiments, including effects of various rotations, plant bed fertilizers, fertilizer placements, and curing methods; crop rotations; growing corn with and without soybeans in the drill; green manure-fertilizer experiment; a study of the effect of heavy initial fertilizer treatments on the rapidity of the development of permanent pastures; and a comparison of methods of seeding Dallis grass on prepared pasture land.

**[Field crops experiments in Tennessee]**, N. I. Hancock, H. C. Murphy, L. S. Mayer, J. K. Underwood, J. J. Bird, G. A. Shuey, B. D. Drain, L. A. Fister, K. L. Hertel, L. R. Neel, B. P. Hazlewood, F. S. Chance, and H. P. Ogden. (Partly coop. U. S. D. A., Iowa Expt. Sta., et al.). (*Tennessee Sta. Rpt. 1938, pp. 8–20, 31, 32, 47, 68, 69, 70, 71, 74, 76, 84, 85, 86, 87, 88, 89, 90, figs. 7*).—Brief reports of progress are made again (E. S. R., 80, p. 182) from experimentation at the station and substations, including breeding work with corn, cotton, oats, barley, sweetpotatoes, soybeans, and winter peas; variety trials with corn (and comparisons of corn hybrids), wheat, oats, barley, rye, sorgo for sirup, tobacco, potatoes, sweetpotatoes, soybeans, edible soybeans, annual and perennial lespedeza, alfalfa, and clovers and grasses; cultural, including planting, experiments with corn, rye, potatoes, lespedeza, and soybeans; fertilizer experiments with corn, sweetpotatoes, potatoes, sorgo, and tobacco; devices and technic for measuring length and fineness of cotton fiber; electricity as a source of heat for storage and slip production of sweetpotatoes; comparison of winter cover crops on cotton; residual effect of *Sericea* on corn yields; seedings of small grains and legumes on Bermuda grass sod; fertilizer crop rotations; rotations for tobacco; and weed eradication in lawns.

**[Field crops experiments in Wyoming]**. (Partly coop. U. S. D. A.). (*Wyoming Sta. Rpt. 1939, pp. 4–6, 25, 26, 27, 28, 29–31, 33, 34, 35, 37, 38*).—Agronomic experiments (E. S. R., 81, p. 502) at the station and substations, again reviewed briefly, included variety tests with winter and spring wheat, oats, barley, grain sorghum, sorgo, flax, corn, potatoes, alfalfa, field peas, soybeans, and miscellaneous forage grasses, clovers, and mixtures; certification work with potatoes; cultural (including planting) experiments with winter and spring wheat, barley, oats, corn, potatoes, sugar beets, crested wheatgrass, and alfalfa; effect of a shelterbelt (two rows of 16-ft. trees) on yields of corn and crested wheatgrass; fertilizer trials with wheat, potatoes (phosphate), alfalfa, barley, and sugar beets; ordinary, manured, and fertilized crop rotations; methods of preparing seedbeds for different crops; irrigation water needs of sugar beets; trials of alfalfa in mixtures with grasses; response of alfalfa to cultivation and manure; pasture studies; and control of quackgrass.

**Emergency forage crops for North Dakota**, T. E. Stoa (*North Dakota Sta. Bimo. Bul., 2 (1940), No. 5, pp. 3–5*).—The merits of oats, millet, Sudan grass, corn, and sorgo as emergency forage crops, especially to offset drought-stricken stands of alfalfa and grasses, are described briefly, with comparative yields of hay or fodder and of nutrients.

**[Pasture and range research in Nevada]**, (Partly coop. U. S. D. A.). (*Nevada Sta. Rpt. 1939, pp. 26–29, figs. 4*).—Brief reports are made on the development of a rotation paddock system of grazing on irrigated meadows by range flocks of sheep, by C. E. Fleming and C. A. Brennen; annual bromegrasses as invaders of sheep and cattle ranges, by Fleming; and control of bindweed, whitetop, and other weeds by competition with reed canary grass, by Fleming, Brennen, and F. B. Headley.

**Pasture improvement and management,** H. B. Cheney (*Iowa Sta. Bul. P8, n. ser. (1940), pp. 241–271, figs. 13*).—Practical information is outlined on the status of pastures in Iowa; steps in improving permanent pastures; management of permanent pastures by use of clovers, grazing management, manuring, and erosion control; practices in establishment of new pastures, with seeds mixtures for long and short rotation pastures and permanent pastures, grasses, and legumes; and suggestions for spring, summer, and fall pastures.

**A comparison of treatments on permanent pastures,** H. B. Sprague, R. E. Blaser, and J. H. Boyce (*New Jersey Stas. Bul. 673 (1940), pp. 16, fig. 1*).—On permanent pasture at New Brunswick, 1935–37, treatment (a) with lime and a complete fertilizer (5–10–8) produced an annual yield of 2,281 lb. of dried herbage per acre with an average protein content of 18.7 percent, while treatment (b) with an equal amount of lime, phosphate, and potash without nitrogen produced 1,921 lb. with a protein percentage of 18.8. Dried herbage cost $16.15 and $12.60 per ton on the first and second treatments, respectively, and the cost of feed produced on these pastures was less than half that of commercial rations. Supplementing treatment (a) with an additional 200 lb. of ammonium sulfate per acre in early June produced a total per acre yield of 2,466 lb. at a cost of $17.78 per ton. Clover rose in abundance from 22 percent on untreated pasture to 36 percent of the total vegetation on treatment (b), but was reduced to 14 percent on treatment (a) and to 6 percent with treatment (a) plus ammonium sulfate in June.

Compared with untreated pasture, treatment (a) in early March increased growth more than threefold for April and more than twofold up to June 15. Treatment (b) which stimulated clover increased yields 44 v. 27 percent for treatment (a). Growth after August 15 was increased 52 percent by treatment (b) and 37 percent by (a). Treatment (b) produced a more uniform growth of herbage throughout the season than did treatment (a), but the total yield per acre was less.

Similar trials of fertilizer treatments on a permanent pasture on Penn shale loam in Hunterdon County produced results similar to those obtained at New Brunswick. Lime and complete fertilizer produced greater early growth but less midseason and fall growth than did the lime and minerals which stimulated clover. Nitrogenous fertilizer without lime and minerals was a poor investment. Application of 300 lb. of sodium nitrate per acre in March increased annual yields only 642 lb. (dried clippings) over untreated plats, and there was no improvement in condition of sod or accumulation of reserve fertility. Potash with lime and phosphate was exceedingly valuable since from 50 to 75 lb. of potassium chloride annually returned increased yields of from 700 to 900 lb. of dried herbage per acre.

Comparisons of lime and fertilizer treatments on 25 permanent pastures distributed throughout the State, with observations on growth, clover abundance, and palatability of herbage, indicated similar responses to those at New Brunswick and in Hunterdon County. A striking increase in palatability of the herbage occurred on treated areas, particularly where clover was increased in abundance. Continued use of complete fertilizer high in nitrogen produced a dense sod of desirable grasses with no apparent tendency to deteriorate in successive years. Practical applications of the results are suggested.

**Efficient pasture production depends upon systematic application of the proper fertilizers,** G. Q. Bateman (*Farm and Home Sci.* [*Utah Sta.*], *1 (1940), No. 2, pp. 1, 9, 10, figs. 3*).—In every case where pastures were fertilized with commercial fertilizers containing available phosphorus as treble superphosphate or nitrogen as ammonium sulfate, or with manure, there was a sub-

stantial increase in the amount of herbage produced. Where phosphate was applied the forage contained more phosphorus and slightly more nitrogen and included a higher amount of clover than that with other treatments. Increase in forage yield after manuring was not so great or immediate but was substantial and probably lasting. Herbage production was increased more where treble superphosphate was applied with ammonium sulfate or manure than where the latter were used alone.

**Influence of unrestricted grazing on northern salt desert plant associations in western Utah,** G. Stewart, W. P. Cottam, and S. S. Hutchings. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *60* (*1940*), *No. 5, pp. 289–316, figs. 20*).—The condition of vegetation in Wah Wah Valley in southwestern Utah grazed by domestic livestock for 70 yr., and severely for the last 50 yr., due to the presence of natural watering places, and in Pine Valley just westward grazed for 50 yr., and heavily during the last 20 yr., although grazing in many areas has been limited to periods when snow was available for stock water, was compared by sample plats on transects more than 20 miles long. Soils were found to be predominantly sandy with a calcareous hardpan at from 16 to 24 in., and in general to contain less than 1,000 p. p. m. of soil salts above depths of from 12 to 24 in., while below this level the salt content increased rapidly to as much as 5,000 or 8,000 p. p. m. Root systems of desert forage species studied were largely limited to the upper 30 cm. of soil where the salt content rarely exceeds 1,000 p. p. m. The root systems of big sagebrush and spiny hop-sage extended much deeper than this, but associations in which they were dominant were limited to areas where even the subsoils have a low salt content.

The forage species preferred by livestock had suffered a higher mortality in the Wah Wah than in Pine Valley, and near watering places than at some distance. Grasses, winterfat, and spiny hop-sage, all high in forage value, also decreased greatly, particularly in Wah Wah Valley. Several of the more palatable shrubs had reproduced scarcely at all in the last 10 yr. and little in the last 20 yr. Small rabbitbrush, a low-value perennial shrub, has invaded communities formerly occupied by grasses and winterfat. Russian-thistle, introduced to the desert two decades ago, is not a serious competitor in vigorous shrub communities, but it has taken possession and apparently retards reproduction of desert shrubs on heavily grazed areas depleted of vegetation. Range management practices for such conditions are mentioned.

**Experiments on the production of alfalfa hay,** S. T. Dexter (*Michigan Sta. Quart. Bul., 22* (*1940*), *No. 4, pp. 265–271, figs. 2*).—Cutting experiments at East Lansing, 1935–37, indicate that the general practice in Michigan of making two cuttings in the bloom stage, based on experience and previous experiments, is still desirable. To obtain the maximum yield in two cuttings, the first cutting should be taken when the plants are blooming and the second cutting about August 15 in most of Michigan. Acre yield may be increased by cuttings made after the first killing frost, but in taking three cuttings good management is necessary. Poor management or cutting at improper stages may result in lower total yields from three cuttings than from two cuttings taken properly, and the extra labor may be justified only when feed is scarce.

**Buffalo grass for lawns,** E. F. Frolik and F. D. Keim (*Nebraska Sta. Cir. 63* (*1940*), *pp. 8, figs. 4*).—Recommendations based on experiments and observations are made on establishment of buffalo grass, selection of desirable grass type, obtaining sod, transplanting sod pieces, and care of buffalo grass lawns.

**A study of corn maturity,** H. C. Rather and A. R. Marston (*Michigan Sta. Quart. Bul., 22* (*1940*), *No. 4, pp. 278–288, figs. 5*).—The development of 10 corn varieties, both open-pollinated and hybrid lines, was studied at East Lansing

*in 1938 and 1939. Grain yield at different stages of maturity and shelling* percentage indicated that corn is not ripe, i. e., not through growing, until the grain contains not more than 40 percent moisture. The maximum yield of dry matter in condition to harvest for silage did not occur until the grain had begun to dent and contained about 50 percent moisture. The total dry-matter yields decreased after the grain had matured fully, due to disintegration of stalks and leaves. Although certain very early varieties were included in these trials, there were no 90-day or 100-day corns. The number of days from planting until the moisture in the grain was down to 40 percent varied widely from place to place and from season to season. The designation of the maturity of a variety by any given number of days proved most unreliable. Adaptation could best be determined by comparison with established varieties. Varietal and harvest recommendations are based upon these considerations.

**S×P cotton in comparison with Pima,** T. H. KEARNEY, R. H. PEEBLES, and E. G. SMITH (*U. S. Dept. Agr. Cir. 550 (1940), pp. 15, figs. 5*).—Pima and S×P varieties of Egyptian-type cotton were both developed at the U. S. Field Station, Sacaton, Ariz., Pima by selection from the older Yuma variety and S×P from a cross between Egyptian Sakel and Pima.

S×P cotton was shown, 1927–37, to possess an advantage over Pima, averaging about 5 percent in yield of seed cotton and about 13 percent in lint production, a higher lint percentage accounted for by larger abundance of lint on S×P seeds, and a larger proportion of the total crop usually in the first picking of S×P, substantiating an opinion of growers that S×P is the earlier. Bolls of S×P seem more wasty than Pima but contain larger quantities of cotton and are picked more easily. S×P seed cotton can be ginned about 20 percent faster than Pima, and the lint is shorter but more uniform in length and lighter colored than that of Pima. Six comparative spinning tests showed that yarns made from S×P usually had a greater breaking strength for all counts from 10 to 120, from 2.4 to 5.4 percent stronger, than corresponding yarns from Pima. The S×P yarns usually were smoother and of better appearance than the Pima yarns.

**Improving the hay crop of the Upper Peninsula,** B. R. CHURCHILL (*Michigan Sta. Quart. Bul., 22 (1940), No. 4, pp. 231–236, figs. 2*).—Upper Peninsula Substation experiments showed that seeding rate as a factor in improving hay stands was less important than choice of variety, lime, inoculation, seedbed preparation, and planting depth. However, planting too deeply undoubtedly has caused many seeding failures throughout the Upper Peninsula. Alfalfa is recommended on soils well supplied with lime or which have produced excellent stands of alfalfa in the past. A mixture probably would be the proper choice on soils with a pH of 6 or below, especially if such soils have not grown alfalfa before, and for most soils the mixture should include alfalfa. As little as 4 lb. of seed per acre returned good yields in the tests, yet an 8-lb. rate is recommended for general conditions. Hay of a much higher quality results from cutting at an earlier growth stage. Hay fields of the Upper Peninsula are often left unplowed for too many years, but should be broken up after a few years and kept in the regular rotation. Grass meadows now being used for hay evidently can be made much more productive by proper fertilization.

**Fertilizer experiments with rice in California,** L. L. DAVIS and J. W. JONES. (Coop. Calif. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 718 (1940), pp. 22, fig. 1*).—On Stockton adobe clay at the Biggs, Calif., Rice Field Station, Caloro rice grown 1925–37, on land fertilized with ammonium sulfate at rates of 100, 150, and 200 lb. per acre made its highest average yield of 4,561 lb. from

the 150-lb. rate, 987 lb. above the check, and also the highest net return, $9.76 per acre. Colusa rice made its highest average yield on land receiving 200 lb. of ammonium sulfate per acre, the 1927–34 average yield increase was 1,370 lb., and the average net return was $10.88 per acre. Ammonium sulfate, 150 lb. per acre at planting, was more effective in increasing yields than when applied during the tillering or heading stages. Superphosphate and potassium sulfate alone or in combination failed to increase yields materially, 1929–37, and when applied with ammonium sulfate neither nor both gave larger yield increases than did ammonium sulfate alone. Indications were that nitrogen was the limiting element in this soil. Ammonium sulfate, 150 lb. per acre, gave an average yield increase of 1,005 lb. per acre and an average net return of $6.73, while the other two materials alone or in combination gave small average yield increases and resulted in net losses of from $2.83 to $5.94 per acre. When rice was grown, 1932–37, on land fertilized with ammonium sulfate, urea, calurea, cyanamide, and several other nitrogen carriers at rates adding 21, 31.5, and 42 lb. of nitrogen per acre, ammonium sulfate was the most profitable at each rate. Plowing under a moderate growth of bur-clover in 2 yr. resulted in increased rice yields, whereas plowing under a heavy growth on very fertile land reduced the average yield.

**The culture and use of sorghums for forage**, J. H. MARTIN and J. C. STEPHENS (*U. S. Dept. Agr., Farmers' Bul. 1844 (1940), pp. II+42, figs. 31*).—Information given on the environmental, soil fertility, and cultural and harvesting requirements of sorghum grown for forage, varieties of sorgo, seed production and sorgo seed as a grain feed, use of forage sorghums for fodder, silage, stover, hay, soiling, and pasture, sorghum v. corn for forage and sorghum-legume mixtures, prussic acid poisoning, and diseases and insect enemies of sorghum supersedes that included in Farmers' Bulletin 1158 (E. S. R., 44, p. 437).

**Some effects produced on sugar cane by minor elements**, R. J. BORDEN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 44 (1940), No. 1, pp. 7–10*).—The growth and the nitrogen, phosphorus, and potassium contents of the juices of sugarcanes were compared when grown on various soils treated with a fertilizer mixture of ammonium nitrate, superphosphate, and potassium sulfate, with and without further addition of a mixture supplying calcium, magnesium, zinc, copper, iron, manganese, and boron. In most instances the additional nutrient mixture increased the yield, though on some soils it caused a significant decrease. The nitrogen, phosphorus, and potassium contents and the sugar content of the juice were in some instances increased and in others decreased by inclusion of the additional elements in the fertilizer. The experiments are regarded as not yet complete enough to permit explanation of differences observed.

**Proper proportioning and timing of nitrogen applications**, R. J. BORDEN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 44 (1940), No. 1, pp. 15–18, fig. 1*).—Data obtained in pot tests with the 31–1389 variety of sugarcane receiving nitrogen at low, medium, and high levels applied in six different ways demonstrated that a proper proportioning and timing of the total nitrogen application for sugarcane is necessary if greatest efficiency is to be secured.

**Border effect in field experiments that are concerned with fertilizer practices**, R. J. BORDEN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 44 (1940), No. 1, pp. 11–14*).—Several practical measures available for eliminating or reducing border effect as a source of error in fertilizer experiments with sugarcane are suggested.

**Tobacco Substation at Windsor, report for 1939**, P. J. ANDERSON, T. R. SWANBACK, and O. E. STREET (*Connecticut [New Haven] Sta. Bul. 433 (1940)*, pp.

*163–209, figs. 16*).—Harvesting, chemical, and fermentation investigations with cigar-leaf tobacco (E. S. R., 81, p. 509) are reported on, with accounts of the incidence and control of insects and downy mildew, and brief data on meteorology, noted on pages —, —, and — of this issue.

*Time of harvesting Havana Seed tobacco.—V, Summary of five years' tests* (pp. 170–177).—The experiments, continued on three different soils during the seasons 1935–39, showed that Havana Seed tobacco should be allowed to remain in the field at least 3 and often 4 weeks after topping before harvested. Exceptions may be necessitated by excessive leaching of fertilizer on sandy soils or by extreme drought which cause premature "firing" of the bottom leaves. The weight of the crop has increased at a rate of about 150 lb. per week during the second and third weeks after topping, with a smaller gain during the fourth week. The increase in weight is due largely to increase in size (surface) of the leaves during these weeks. The grading also improves during each successive week. Late harvesting accelerates the speed of curing, shortens the period of danger from shed troubles, and also gives the characteristics of "ripeness" favored by dealers and manufacturers.

*Variation in chemical composition of cured tobacco leaves according to their position on the stalk*, H. R. Hanmer, O. E. Street, and P. J. Anderson (pp. 177–186).—Using the Brown and No. 211 strains of Havana Seed tobacco, leaf-by-leaf analyses for total ash, potash, calcium, magnesium, total nitrogen, protein nitrogen, volatile bases, nicotine, and ammonia were made to determine variation in percentage of these components as influenced by leaf position. Total ash decreased from bottom to top, being about twice as abundant in the lower as in the top leaf. The average content in Connecticut tobacco is about 25 percent. The leaves became more acid from bottom to top. The percentage of potassium was highest in the ninth to twelfth leaves, although previous analyses had shown it to be higher in the bottom leaves. The trend was not so marked as for the other mineral bases. Calcium was highest in the lower leaves and diminished regularly upward, so that it was 2 or 3 times as high in the bottom as in the top leaf. Magnesium showed the same trend as calcium and was about twice as high in the lower as in the top leaf. Total nitrogen was highest in the top leaves and decreased regularly to the bottom where it was only about one-third as high as in the top. Protein nitrogen showed the same trend as total nitrogen, but the difference between top and bottom was not so great. Total volatile bases increased rapidly from bottom to top leaves. Nicotine was more than 3 times as high and ammonia 25 to 60 times as high in the top as in the bottom leaves.

*The role of yeast in the fermentation of tobacco.—II, Further tests on cigar binder types*, O. E. Street (pp. 206–209).—In commercial tests on yeast application to Havana Seed binder tobacco, the grade known as "darks" was benefited greatly by treatment with yeast up to 1 percent, treated tobacco having a more completely fermented appearance and a pleasanter aroma. When untreated darks and the 0.75 percent yeast-treated were used as binders on cigars with the other components identical, smoking test results overwhelmingly favored the cigars with the treated binders, while differences with seconds were not as great as with darks. Appearance and aroma of the treated tobacco were superior to the check. With No. 2 seconds, differences were consistently in favor of the treated tobacco in temperature gain appearance, and aroma.

**The "why" of wheat improvement, F. T. Dines** (*Oklahoma Sta. Cir. 90* (*1940*), *pp. 6*).—Mixtures with other types of wheat and with rye and smutty wheat are discussed as factors resulting in offgrade wheat in Oklahoma.

**A study of rapid deterioration of vegetable seeds and methods for its prevention,** V. R. BOSWELL, E. H. and V. K. TOOLE, and D. F. FISHER (*U. S. Dept. Agr., Tech. Bul. 708 (1940), pp. 48, figs. 3*).—Seed of lima beans, kidney beans, sweet corn, peanut (shelled), beet, spinach, cabbage, carrot, onion, and tomato were stored at 80° and 50° F., at low (44 to 51 percent), medium (66), and high (78 to 81 percent) humidities at each temperature. Changes in moisture content and in germination were determined on samples taken every 10 days for 110 days, and after 251 days, and at different times seed was removed and dried at about 150° and 120° for moisture determinations and germination tests.

Moisture contents reached equilibrium in about 20 days for the smaller and in from 20 to 40 days for the larger seeds. Peanuts had the lowest moisture content (5 to 8 percent) at a given humidity and changed least with change of humidity, while kidney beans attained the highest moisture content at high humidity (above 15 percent) and changed the most with increase of humidity (10 to 15 percent). Although cabbage and tomato seed showed a change of moisture content with change of humidity only slightly greater than peanuts, at each humidity moisture was higher. Seed stored at a given relative humidity at 50° showed a tendency toward a higher moisture content than at 80°. Moisture content was correlated more closely with r. h. than with any other expression of air condition.

At high humidity and high temperature the germination of onion seed fell from 80 to 38 percent in 20 days and of peanuts from 83 to 44 percent in 40 days. After 110 days the germination of these seeds had fallen to zero, and of spinach and sweet corn to 25 percent or less, while only beet and tomato seed maintained a germination above 70 percent. At low humidity and low temperature, only kidney bean and sweet corn had fallen significantly in germination in 251 days. In warehouse storage in summer deterioration was in general comparable with that at 66 percent humidity and 80°. It was noted that the deterioration of different kinds of seeds at high temperature and high humidity was not always in proportion to their relative moisture-absorbing capacities. Seeds removed from the various storage conditions after intervals of from 10 to 110 days and held at 32° and 60 percent humidity for from 6 to 9 mo. gave germinations comparable with results of tests made as the seed was removed from test storage.

Moisture content of seed from high humidity storage was lowered from 4 to 5 percent by heating in moving air at 120° or 150°, the required time varying from 0.5 hr. for the smaller seeds to 3 hr. for beans. Heating beans for 3 hr. at 150° damaged viability, particularly if the seed had been injured previously by storage. Peanut was especially susceptible to injury by heating (1.5 hr.). Smaller seeds, however, heated for shorter periods, showed no injury.

**The weed problem of the Upper Peninsula,** B. R. CHURCHILL (*Michigan Sta. Quart. Bul., 22 (1940), No. 4, pp. 255–258*).—Examination of 84 samples of soil from farms in 14 counties showed viable weed seed per square foot to average for pastures 126, grain 116, and cultivated fields 39 on clean farms, and 296, 183, and 155 seeds, respectively, on weedy farms, differences attributable to cropping practices. These data and the weed-seed contents of samples of grass seed for sale and oats and barley for seeding indicated the presence of a serious weed problem in the region and that it is being perpetuated by planting weedy grain and hay-crop seeds. Crop rotation, good seedbed preparation, summer fallow, clipping, and other recommended practices will go far toward eradication of weeds on most farms when and if growers cease planting weed seeds.

**The pigweeds and their relatives in North Dakota,** O. A. Stevens (*North Dakota Sta. Bimo. Bul., 2 (1940), No. 5, pp. 8, 9, fig. 1*).—Species mentioned include the common, tumbling, and creeping pigweeds (*Amaranthus* spp.), lambsquarters (*Chenopodium album*), narrow-leaved goosefoot (*C. leptophyllum*), Russian-thistle, saltbush (*Atriplex hastata, A. nuttallii*), winterfat (*Eurotia lanata*), sea blite, burningbush, and Russian pigweed.

## HORTICULTURE

[**Horticultural studies by the Hawaii Station**], M. Takahashi, L. A. Dean, E. T. Fukunaga, J. E. Welch, G. K. Parris, D. Sumida, W. W. Jones, H. D. Michener, M. E. Hartung, J. H. Beaumont, Minn, and [B. J.] Cooil (*Hawaii Sta. Rpt. 1939, pp. 21, 32, 43–45, 46–57, 58–60, figs. 5*).—Included are brief statements as to progress of the following investigations: Fertilizer needs of sweet corn; fertilizer requirements of coffee; development and selection of rust-resistant snap beans; variety tests of vegetables; sterilization treatment of the papaya; production of ethylene by the ripening papaya fruit; genetics of the papaya; use of colchicine in inducing polyploidy in the papaya; breeding of the papaya; culture of the boysenberry and youngberry; asexual propagation of the litchi; development of oil in the macadamia nut; varietal and cultural tests with macadamia; relation of growth to yield in the coffee plant; and the recording of seed and plant introductions.

[**Horticultural studies by the Kentucky Station**] (*Kentucky Sta. Rpt. 1939, pt. 1, pp. 25–28, 55, 56*).—There are presented brief reports on the following projects: Testing of peach varieties for resistance to low temperatures occurring during the flowering period; mulching, pruning, and fertilizer tests with raspberries; N and P nutrition of tomato plants; variety tests of tomatoes; and the N and P needs of snap beans.

In addition data are presented on mulching and spraying studies with red raspberries at the Western Kentucky Substation.

[**Horticultural investigations by the Ohio Station**] (*Ohio Sta. Bul. 600 (1939), pp. 35–40, 41–43, figs. 4*).—Among investigations the progress of which is discussed are the use of synthetic growth substances in rooting cuttings of ornamentals; culture of flowers in gravel or cinders supplied with nutrient solutions; effect of deficiency of minor elements on flowering plants; growing of flowers in cloth houses; effect of steam sterilization of the soil on greenhouse flowers; effect of artificial drought on size of apple fruit; effective date for picking red strains of apple; effect of type of storage on rate of ripening of apples; testing the boysenberry and Indian Summer red raspberry; testing of tomato and cabbage varieties; adequate ventilation as a control of tomato leaf spot in hotbeds; and the effect of varietal, cultural, harvesting, and storage conditions on the vitamin C content and acidity of tomatoes.

[**Horticultural studies by the South Carolina Station**], A. M. Musser, L. E. Scott, F. S. Andrews, W. C. Barnes, and O. B. Garrison (*South Carolina Sta. Rpt. 1939, pp. 45–53, 60–64, 161–167, 175, 176, 182, 184, 185, figs. 4*).—Studies the progress of which is discussed include the testing of peach varieties, factors affecting the yield of bush lima beans, yield and size of asparagus spears as influenced by the depth of the bed over the crown at the time of cutting and length of green on the harvested spear, varietal resistance of peach buds to cold injury in the spring of 1939, culture of the castor-bean, treatment of garden pea seed with red copper oxide, testing of vegetable varieties, effect of waxing cucumbers upon the loss of weight following harvest, and the testing of cantaloup, watermelon, and cucumber varieties.

[**Horticultural studies by the Tennessee Station**], B. D. DRAIN and L. A. FISTER (*Tennessee Sta. Rpt. 1938, pp. 65–74, figs. 6*).—Among studies upon which progress reports are presented are breeding of garden beans, red raspberries, pears for fire blight resistance, leaf spot-resistant tomatoes, and strawberries; improvement of pyrethrum; testing of imported ornamentals; testing of fruit and vegetable varieties; depth of planting asparagus; protection of vegetables by wax emulsion; and irrigation of vegetables.

[**Horticultural investigations by the Wyoming Station**] (*Wyoming Sta. Rpt. 1939, pp. 26, 27, 31, 32, 33*).—Included are brief reports on the results of testing fruit and vegetable varieties and on the distribution of tree seedlings for shelterbelt and other uses.

**Natural crossing in lima beans in Maryland**, R. MAGRUDER and R. E. WESTER (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 731–736*).—Employing varieties with markedly contrasting characters, the authors found that the amount of natural crossing during 1934 and 1935 in the field at Beltsville, Md., in lima beans was higher than expected. Recognizable hybrids in the progeny of individual plants varied from 0 to 82.9 percent. Part of the variability in amount of natural crossing may be attributed to the proximity and proportion of plants with dominant characters in the selected family and its neighbors. Another part of the variability may be due to individual plant characteristics not correlated with position in the field. When the probabilities of cross-pollinations that were not detectable (among flowers on the same or similar plants) are added to the observed, natural crossing in this material would seem to be the rule rather than the exception. A list of insects is given which were observed feeding on the flowers in such a way as to effect hybridization.

**Premature seeding studies with beets**, O. SMITH. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 793–798*).—Three experiments were conducted with mature roots and seedlings of Detroit Dark Red beets to determine the effects of photoperiodism, temperature, light intensity, leaf area exposed to light, continuous light, continuous darkness, and age of plant during light and temperature treatments on subsequent seedstalk development. When grown at 65° F. in the greenhouse, few seedstalks developed from mature field-grown roots regardless of photoperiod. The same plants when shifted to 55° produced a high percentage of seedstalks. Plants grown in continuous darkness from mature roots produced no seedstalks at 55°, but when shifted to continuous light 80 percent developed flowers and seed. Exposure of plants to light intensities of ±500 footcandles resulted in slightly more seedstalk formation than exposure to 200 footcandles intensity, and exposure to continuous light resulted in still greater seedstalk response. Two weeks' exposure of seedlings in total darkness at 50° appeared to stimulate seedstalk formation more than a similar length of exposure to continuous light of 500 footcandles intensity at 55° when both were subsequently grown in continuous light at 55°. In general, plants from 33 to 47 days old at the initiation of the cold and light treatments responded more quickly and to a greater degree than plants either older or younger.

**Canning beets need boron**, R. L. COOK and C. E. MILLAR (*Michigan Sta. Quart. Bul., 22 (1940), No. 4, pp. 272–278, figs. 4*).—Greenhouse experiments (1939) with canning beets on Thomas sandy loam soil and in the field on Emmet sandy loam and Bergland loam showed that certain abnormalities, such as black, corky areas within the root tissue, surface cankers on the roots, an intensified reddening of the leaves, twisted and nonsymmetrical leaves, cross-checked leaf petioles, and numerous small leaves, may be corrected by applying small amounts of boron. An application of 10 lb. of borax per acre, mixed with

Thomas sandy loam soil, greatly increased the yields of roots and tops in pot culture. Borax used in the field did not increase total yields but did increase the percentage of marketable beets by reducing the number of roots showing internal break-down. The quantity of borax necessary to reduce significantly the percentage of abnormal beets ranged from 10 to 30 lb. on different fields. It is suggested that this variation is due to differences in soil texture and organic matter. Boron deficiency symptoms in canning beets were not so completely controlled by applying borax as have been similar symptoms in sugar beets. It is believed that better results may be obtained with some different method of application. More experimental work is necessary before recommendations can be definitely made regarding rates and methods of borax applications for canning beets. Attention is again called to the fact that the data reported in this paper are the results from only 1 yr. of experimentation.

**Experimental work on cucumbers,** W. S. Anderson. (Partly coop. U. S. D. A. et al.). (*Miss. Farm Res.* [*Mississippi Sta.*], *3* (*1940*), *No. 5, p. 7, fig. 1*).—Favorable results with respect to total yield and percentage of No. 1 pickles were secured from applications of commercial fertilizers. On a moderately fertile soil, from 800 to 1,000 lb. of a 4–8–6 or 6–8–6 material gave good results. On a newly prepared field of Ruston sandy loam, economical results were secured with applications up to 1,000 lb. per acre of a 6–8–8 material. Increases in the percentage of N up to 8 increased yields when used in connection with 8 percent each of P and K. A total of 97 varieties and selections of pickling cucumbers were grown, and breeding studies were conducted in cooperation with the Bureau of Plant Industry in improving types of cucumbers adapted to the State.

**Some factors influencing field germination and seedling vigor of Imperial 152 lettuce seed,** W. A. Frazier. (Ariz. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 36* (*1939*), *p. 701*).—Highest field germination and seedling vigor of new seeds was obtained from seeds stored at from 75° to 88° F., as compared with 40°, when seedings were made under high-temperature conditions of early fall. Exposure of new seeds for varying lengths of time at 130° was ineffective in increasing germination or seedling vigor. Rather, there was a consistent tendency toward decrease in germination and vigor with increase in time of exposure to 130°. First seeds harvested in the Salt River Valley in the spring were larger and gave higher field germination and seedling vigor than seeds from later harvests.

**Studies in the nutrition of vegetables: Phosphate deficiency and yield tests on sand cultures of May King lettuce,** R. M. Woodman (*Jour. Agr. Sci.* [*England*], *29* (*1939*), *No. 2, pp. 229–248, pl. 1*).—When May King lettuce was grown in sand cultures devoid of phosphates, the resulting stunted plants showed bronzing of the leaves and red or crimson stalks. When phosphate alone was used in cultures, characteristic purple (or bronze) and apple-green, flat, stunted rosettes with broad, noncrinkly leaves and red stalks appeared, while water alone caused stunted, straggly, purple plants having relatively long crimson stalks. A plant of normal color was produced at first where some phosphate was supplied in addition to the other essential elements, but if the supply was inadequate purple blotches appeared on the plant, the intensity of which became greater as the amount of phosphate in the medium diminished. A tougher leaf was noted as a result of phosphate deficiency, while an adequate supply caused earlier maturity. An increased phosphate supply produced fresh and dry weights of the tops proportionately greater than those of the roots.

**Pollination studies with the Michigan State Forcing tomato,** A. F. Yeager (*Michigan Sta. Quart. Bul., 22* (*1940*), *No. 4, pp. 242, 243*).—The average production of greenhouse-grown tomato plants was slightly greater for jarred

than for hand-pollinated plants. The fruit size was also larger, and the average number per plant was greater in the case of jarring, although these differences were in no case significant. The evidence was that for the spring crop of Michigan State Forcing, a variety with a short pistil, the jarring method of pollination is just as satisfactory as hand pollination.

**Mutation in chilli** (*Indian Farming, 1 (1940), No. 4, p. 178*).—In a brief anonymous note it is stated that a mutant form was observed at the Imperial Agricultural Research Institute, New Delhi, India. The outstanding characteristic is the much shortened internodes, which give the appearance that the leaves, fruits, and flowers are borne in clusters.

**Production of hops,** G. R. Hoerner and F. Rabak. (Coop. Oreg. Expt. Sta.). (*U. S. Dept. Agr., Farmers' Bul. 1842 (1940), pp. 11+41, figs. 21*).—General information on climatic adaptation, propagation, varieties, culture, training of vines, harvesting, curing, disease and insect control, production costs, etc.

**Fruit thinning an essential to quality and yield,** T. E. Ashley (*Miss. Farm Res.* [*Mississippi Sta.*], *3 (1940), No. 5, p. 8*).—Information on the practices and advantages, with special reference to the peach and apple.

**Pruning fruit trees,** S. W. Edgecombe (*Iowa Sta. Bul. P10, n. ser. (1940), pp. 289–319, figs. 18*).—General information is offered relative to the principles and practices of pruning, with special reference to the apple, pear, peach, plum, and cherry. Consideration is given to both immature and fruiting trees.

**Chromosome counts on Hibernal and Northwestern Greening apples,** F. B. Lincoln. (Md. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), p. 217*).—A count of 68 chromosomes was recorded in root tips of "self-rooted" Hibernal apples obtained from the Iowa Experiment Station and from layers of Hibernal. Unguarded seedlings of Nevis and certain other specimens of *Malus ioensis* showed 34 chromosomes. Unguarded seedlings of Waziya and Wetanka had 34, and Wecota 51 chromosomes. Northwestern Greening, the pollen parent of Waziya, Wetanka, and Wecota, had 34 chromosomes in the root tips of layers.

**Root forming ability of apple layers,** F. B. Lincoln and J. Amatt. (Md. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 283–286, figs. 2*).—Utilizing an extensive collection of apple materials, including collected wildings, Gleishberg and Hatton stock types, and horticultural varieties, the authors found only 1 kind in the total of 287 which failed to form roots on the daughter plants when propagated by the trench-layer method. However, since this 1 variant formed roots on the mother wood there was, in reality, no exception in ability to form roots. Due to the great variation in the number, size, texture, and point of initiation of the roots produced by the clons, it was possible to classify them into 6 root types. A very definite relation was established between the position of root initiation and the bud. Roots were always found in 1 or more of 4 positions in relation to the bud, directly above the bud, directly below the bud, or at each side a little below the bud. Since the materials used consisted of such a large and randomized selection, the authors conclude that the results are indicative of the root-forming ability of the shoot wood of *Malus domestica*.

**The effect of Malling II and IX rootstocks on six apple varieties,** R. H. Sudds and G. E. Yerkes. (W. Va. Expt. Sta. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 319–321*).—In this second contribution (E. S. R., 82, p. 773), the authors report that with the four varieties York Imperial, Gallia Beauty, Staymared, and Starking the Malling IX rootstock has produced a very much dwarfed tree as judged by any standard. With Jonathan, a much larger and heavier tree has resulted but one still significantly smaller in trunk circumference than those on Malling II. Malling IX had no commer-

cial possibilities under conditions in the Cumberland-Shenandoah Valley, although it was found useful for certain special purposes. Precautions should be taken to prevent scion-rooting with the Malling IX rootstock. Malling II is worthy of further trial on deep, fertile soils as a stock inducing some degree of dwarfing with the prospect of yielding a profitable quantity of fruit.

**Effects of various amounts of nitrogen, potassium, and phosphorus on growth and assimilation in young apple trees,** L. P. Batjer and E. S. Degman. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *60* (*1940*), *No. 2, pp. 101–116, figs. 8*).—For 1-year-old whips of York Imperial apples grafted on French seedling piece roots and growing in sand cultures in glazed crocks it was found that concentrations of N below 60 p. p. m. reduced the growth almost quantitatively, the largest difference occurring at 15–30 p. p. m. At 60 p. p. m. of N the trees made somewhat less growth than at 168 p. p. m., but the differences, measured as linear growth and dry weight, were not statistically significant. K at 60 p. p. m. gave less growth than at 117 p. p. m., and less occurred with each decrease in concentration. The greatest differences in growth occurred at 4–10 p. p. m. of K. Definite K-deficiency symptoms did not appear in the trees receiving 10 p. p. m. or more of K, although growth increased until more than 60 p. p. m. of K were supplied. In the P series, growth was approximately uniform in all treatments receiving 4 p. p. m. or more of this element. Only the complete absence of P resulted in deficiency symtoms.

The N and K contents of the plant tissues, particularly of the leaves and bark, increased with increasing concentrations of these elements in the nutrient solutions. The rate of photosynthesis per unit of leaf area was reduced in the N series as the concentration of N was decreased in the solution. A similar but less marked decrease occurred in the K series. The application of N to trees which had been on a low-N level up to the time of forming terminal buds in late August increased the rate of $CO_2$ assimilation and greened the foliage. An increase in N content of the leaves accompanied the increase in $CO_2$ assimilation.

**A study of pollen germination upon the stigmas of apple flowers treated with fungicides,** L. H. MacDaniels and E. M. Hildebrand. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 36* (*1939*), *pp. 137–140, figs. 2*).—Continuing the general investigation (E. S. R., 82, p. 48), the authors report that 2–6–100 bordeaux mixture, 20–80 copper-lime dust, and "Mike" sulfur apparently reduce but do not inhibit growth of pollen upon the stigma. This may be due either to failure of sprays and dusts to come in contact with all pollen grains on the stigmatic surface or possibly, in the case of dusts, to failure of the material to go into solution sufficiently to be toxic to the germinating pollen grains. Elgetol at 0.25 percent prevented pollen germination on stigmas. Field trials indicated that this material has great promise for spraying in bloom to inhibit fruit set on apple trees. The concentration which will be effective with some varieties in preventing a set and not cause serious injury is ±0.1 percent.

**Pollen tube growth in apple styles after inter-varietal cross-pollination,** O. Heilborn (*Lantbr. Högsk. Ann.* [*Uppsala*], *7* (*1939*), *pp. 171–183, figs. 4; Swed. abs., pp. 181, 182*).—Tracing the course of pollen-tube development in 10 crosses between diploid varieties of apple, the author noted marked differences in the several combinations. In certain crosses the pollen tubes grew very rapidly through the stylar tissue, in others growth was moderate, and in still others growth ceased shortly below the stigmatic surface with the tube ends swollen badly. For the most part, the results checked closely with pollination behavior in the orchard.

**Fruit thinning.—I, The relationship of fruit size in unthinned apricot trees to crop and season,** O. Lilleland and J. G. Brown. (Univ. Calif.).

(*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 165–172, figs. 6*).—Uniform Tilton apricot trees planted in 1922 were found to vary in "the number of fruits harvested" from 3,000 to 12,000 fruits in 1938 and from 2,000 to 10,000 in 1939. Average size of fruit on a tree was highly correlated with number of fruits borne. Fruit size was markedly affected by seasonal factors. A thinning practice is, therefore, not equally effective in increasing size in all seasons. There appeared to be a minimum tree load below which appreciable improvement in the percent weight of marketable fruit cannot be attained. The "minimum" is not changed in seasons of unfavorable fruit sizes. The "minimum tree load" for the trees included in this study was found to be 6,000 fruits. Any thinning with a set less than 6,000 appeared uneconomical. The apricot grower was found unable to produce large-sized apricots profitably in a "poor sizing season." The total weight of fruit increased with an increase in number. The weight of "fruit larger than 12 per pound" was not reduced in the heavier sets. The percentage of small fruit increased with an increase in the number of fruits. Variability in the capacity of trees to size a given number of fruits precludes dependable thinning data from a small number of uniform-appearing trees.

**The effect of several spray materials on the size, color, and per cent solids of the fruit of the Montmorency cherry,** E. J. Rasmussen. (Mich. State Col.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 367–370*).—Investigations conducted at East Lansing, Mich., in an orchard of 7-year-old Montmorency cherry trees showed that spraying with concentrations of bordeaux 4–6–100 and stronger produced cherries darker in color, smaller in size, and higher in total solids than trees sprayed with lime-sulfur. Trees sprayed with weak concentrations of bordeaux and with proprietary copper materials produced cherries somewhat darker in color, higher in total solids, and similar in size to fruit grown on trees sprayed with lime-sulfur.

**Further study on the productiveness of secondary and lateral peach shoots,** T. E. Ashley. (Miss. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), p. 208*).—It was shown previously (E. S. R., 83, p. 61) that lateral shoots (arising from lateral buds on 1-year-old or older wood) of the Hiley peach were potentially more productive than secondary shoots (arising from lateral buds on current season's growth). Results in 1939 substantiate those previously noted. In all cases the number of fruit buds per shoot, total buds per shoot, average number of fruits per shoot, and percentage of fruit set were greater in the lateral than in the secondary shoots.

**Some plant characteristics of the second generation progeny of Prunus persica and Prunus kansuensis crosses,** E. M. Meader and M. A. Blake. (U. S. D. A. and N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 223–231, figs. 7*).—Stating that *P. persica* and *P. kansuensis* are closely related species and may be crossed without difficulty, the authors report that the $F_1$ generation was fully fertile and that plant characteristics of both species reappeared in the $F_2$ progeny. Healthy, vigorous seedlings predominated in number in both $F_1$ and $F_2$ progenies. Due to a short rest period, response in growth to favorable temperatures during mild periods in midwinter resulted in high percentages of winter-injured fruit buds upon most of the $F_2$ seedlings. Flowers of all $F_2$ seedlings showed considerable frost resistance at anthesis. Small, nonfunctional ovaries at anthesis appeared to be responsible for the failure of some seedlings to fruit. Only 11 of 24 $F_2$ seedlings have fruited. Soft, watery, clingstone fruits of small size, low quality, and high tannin content predominated in the $F_2$ generation. No $F_2$ seedlings bore fruits larger than those of the $F_1$ generation. Form of fruits varied from round to oval, with one instance of a peculiar irregular type. The fewness of the second genera-

tion progeny and the failure of over half of these seedlings to fruit have retarded and in part prevented the study of plant characteristics typical of *P. kansuensis* and of *P. persica*.

**A three year study of maturity indices for harvesting Italian prunes,** D. V. Fisher (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 183–186*).—Data obtained on the fruit harvested in successive weekly pickings from four mature trees in orchards of the Dominion Experimental Station, Summerland, B. C., showed that sugar content, as measured by the Zeiss refractometer, is a consistent and economical indicator of harvesting maturity in the Italian prune. A soluble-solids content of 17 percent was found to be the minimum at which prunes of satisfactory quality for the fresh fruit market can be picked. The pressure test of prunes having a soluble-solids content of 17 percent was found to vary from season to season, suggesting that the pressure test is not a satisfactory maturity index for prunes. Increased uniformity in maturity of prunes was secured by harvesting full-bearing trees in two pickings a week apart.

**The cool storage of plums.—Progress report,** F. E. Huelin and G. B. Tindale (*Jour. Dept. Agr. Victoria, 38 (1940), No. 5, pp. 247–253, fig. 1*).—Several varieties of plums picked at two stages of maturity and stored at 32° F. in air and in "gas" (5 percent and 10 percent $CO_2$) were subsequently ripened at both 45° and 60° and the storage life at 32° determined. The results indicated that for local storage (ripening after storage proceeds at 60°) most varieties can be stored at 32° for 6 weeks, whereas for export (ripening after shipping proceeds at 45°) the limit at 32° for most varieties is 4 weeks. Allowing 1 week at 32° for precooling and awaiting shipment, the limit at 32° on board ship for most varieties is 3 weeks, after which the temperature should be raised to 45°. Most varieties take about 5 weeks to ripen at 45° after storage at 32°. Varieties differed greatly in their length of storage life. The Wickson variety, stored at 32° and ripened at 45°, had a storage life at 32° of only 2 weeks, and is, therefore, unsuited for export, while, at the other extreme, the Cole Golden Gage variety, under the same conditions of storage and ripening, had a storage life at 32° of 8 weeks. The export of the Satsuma and President varieties under the above conditions, recommended for export, would be attended with a certain amount of risk. For most varieties, gas storage definitely decreased the storage life, and with some varieties even as little as 2 percent of $CO_2$ proved harmful. Gas storage slightly increased the storage life of the Cole Golden Gage and Satsuma varieties.

**Cold storage of Indian fruits,** D. V. Karmarkar and B. M. Joshi (*Indian Farming, 1 (1940), No. 4, pp. 173–177, pls. 2*).—Stating that all the ordinary temperate, semitropical, and tropical fruits are grown in India because of the wide diversity of conditions, the authors report that cold storage trials are in progress at the Ganeshkhind Fruit Experiment Station near Poona with the mango, orange, banana, chikoo, litchi, apple, peach, pear, and other species. Of mango varieties, the Alphonso was the best keeper in both cold and ordinary storage. At from 45° to 48° F., well-matured Alphonso mangos in green, hard state could be held for 7 weeks and subsequently ripened satisfactorily in ordinary temperatures. Mangos were particularly subject to low-temperature injury. Work with oranges showed considerable variability in the keeping of different types. Mosambi oranges kept in good condition for 4 mo. at 52° and for 5 mo. at 40°. Malta oranges were held for 4 mo. at 40° in good condition. The Assam orange did not keep well in cold storage. Bananas as a rule did not keep well below 56°. Ripe chikoo fruits were kept at 32° and 35° for about 6 weeks. Unripe chikoo fruits were chilled at 45° or below and failed to mature satisfactorily. Litchi turned brown externally, but the flesh remained in good condition for 3 mo. at from 30° to 45°.

In the case of deciduous fruits, Delicious apples kept in good condition for over 8 mo. at 32° and 35°. Elberta peaches grown in the North-West Frontier Province kept in good condition for 1 mo. at 32° and 35°. Williams (Bartlett) pears were kept for 3 mo. at 32°.

**The Ontario grape and its seedlings as parents,** R. WELLINGTON. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 630–634*).—Stating that Ontario, a variety obtained by the station from a cross of Winchell×Diamond, has been especially potent in yielding excellent seedlings, the author summarizes, largely in tabular form, the results of crosses in which Ontario or one of its seedlings had been used as a parent. Crosses on early varieties and Ontario have given mostly early or medium-early varieties, and crosses between Ontario and medium and late varieties have yielded few early seedlings. Good quality appeared more frequently in the progeny of Ontario crosses than in most other crosses involving American grapes. Particularly favorable results were secured from crosses of Ontario with Mills and with Keuka (one-half Mills). Among promising new grapes with Ontario parentage are Seneca, Watkins, Wayne, Yates, Eden, and Buffalo.

**The Brainerd blackberry in central Illinois,** A. S. COLBY. (Univ. Ill.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 593–596, fig. 1*).—Brainerd, a variety originated by the U. S. Department of Agriculture (E. S. R., 67, p. 135), was found very satisfactory on the basis of a 5-yr. trial. The plants were vigorous, productive, and more resistant than Eldorado and Alfred to anthracnose, leaf spot, and red spider. The plants withstood a minimum of −21° F. in February 1936 with relatively little injury. The fruits were found attractive, somewhat larger than Eldorado or Alfred, and of excellent quality when allowed to mature fully on the plant.

**Use of $CO_2$ to retard the development of decay in strawberries and raspberries,** J. D. WINTER, R. H. LANDON, and W. H. ALDERMAN. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 583–588*).—In this second contribution (E. S. R., 80, p. 198), the authors state that it was found possible to extend the time that red raspberries and strawberries could be held in good market condition by treating the fruit with $CO_2$ at temperatures of from 55° to 60° F. and relative humidity of from 80 to 90 percent. An initial concentration of 30 percent $CO_2$ was found to be most practicable, and no advantage was found in using a constantly maintained concentration of the gas. Initial concentrations of 45 percent or more of $CO_2$ and maintained concentrations of 25 percent or more produced loss of flavor in these fruits after varying periods of exposure. No loss of flavor occurred with initial concentrations of from 30 to 35 percent of $CO_2$.

**Strawberry and raspberry varieties for freezing storage,** J. D. WINTER. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 579–582, fig. 1*).—After careful grading and washing, berries were placed in small containers of different sizes and materials, together with granulated sugar in most cases and sugar sirup in others. Freezing was accomplished at approximately −10° F. The duration of the freezing period was from 6 to 10 mo. Among the named June-bearing varieties, Beaver, Culver, and Dorsett were found most satisfactory for freezing storage. Among everbearers, Gem and Wayzata were also satisfactory. Among red raspberries tested, Chief, Latham, and Viking proved best adapted for freezing preservation. Condition of fruit at time of storage was found a most important consideration.

**Fruit set of citrus: Effect of spring soil moisture upon drop of young fruit,** J. R. FURR, C. A. TAYLOR, and J. O. REEVE. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 152–157, figs. 3*).—Studies of the effects of high, medium, and low soil moisture on the June drop of Washington Navel oranges

in the intermediate climatic zone near Glendora, Calif., and of Valencia oranges in the coastal zone near La Habra showed that although relatively high water deficits developed in the trees under certain of the treatments the set of fruit per thousand leaves was affected only slightly or apparently not at all by the treatments. The two seasons in which the experiments were carried out were free from periods of abnormally high temperature during the drop period.

**Physiological studies of plastid pigments in rinds of maturing oranges**, E. V. Miller, J. R. Winston, and H. A. Schomer. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *60* (*1940*), *No. 4*, *pp. 259–267*, *fig. 1*).—Describing an adaptation of the Clifford photometer for quantitative determinations of the plastid pigments, the authors report that periodic analyses made on the rinds of Parson Brown, Pineapple, and Valencia oranges at different stages of maturity showed that as the chlorophyll decreased the carotenoids increased and continued to increase after the chlorophyll had disappeared. Fully colored tangerine and Temple orange rinds contained a greater quantity of carotenoid pigments than did the rinds of mature green fruits. Ethylene treatment of mature green oranges stimulated decomposition of chlorophyll without any significant effect on the carotenoid pigments. In the samples taken when the fruits were mature green, the methanol fraction (xanthophyll) predominated in the carotenoids in the rind. Later, when the fruit had attained its highest carotenoid content, the petroleum-ether fraction (cryptoxanthin, carotene) was much higher than the methanol fraction. Pineapple oranges selected from the northeast side of the tree in the spring owe their superiority in color over those on the southwest side to the higher petroleum-ether fraction of the carotenoids. This is true also when there is a difference in color of the two sides of the same fruit.

**Pecan grafting methods and waxes**, B. G. Sitton (*U. S. Dept. Agr. Cir. 545* (*1940*), *pp. 31*, *figs. 5*).—Unsatisfactory results following attempts to top work pecan trees (*Carya pecan*=*Hicoria pecan*) were characterized by dieback, wood rot, or borer injury. Dieback and wood rot were due primarily to failure of the scion to establish union with the stock at the apex of the grafted stub. To a large extent, borer damage followed a failure of the covering material to maintain complete coverage. Nine modifications of the bark graft were tested, and the inlay type with the scions nailed to the stock and covered by a suitable wax resulted in a higher percentage of good unions than other methods tried. Covering materials which did not completely protect the graft proved responsible for many failures to obtain good unions. Eighty materials were tested, and 2 were found which resulted in a high percentage of growing scions and of good unions free from borer and wood-rot damage. The better of the 2 was composed of 10 parts of rosin, 2 parts of beeswax, and 1 part of kieselguhr. The other was similar except that talc was substituted for the kieselguhr. Oil used as an ingredient of waxes seemed to be injurious to the cambium of the pecan.

**Chrysanthemums made to bloom earlier or later**, F. S. Batson (*Miss. Farm Res.* [*Mississippi Sta.*], *3* (*1940*), *No. 5*, *p. 2*).—Restricting the photoperiod to 10 hr. by covering plants with dark cloth during the early-morning hours was found effective in bringing early-flowering varieties of chrysanthemums into bloom prior to their natural season. On the other hand, subjection of late-blooming varieties to supplementary light during the summer kept them in a vegetative, nonflowering condition, with the result that flowering was delayed beyond the natural period.

**Gladiolus culture in Iowa**, L. C. Grove (*Iowa Sta. Bul. P12*, *n. ser.* (*1940*), *pp. 337–359*, *figs. 15*).—Information of a general nature is presented with reference

to propagation, cultural requirements, control of insect and disease pests, varieties, and the use of the gladiolus for decorative purposes.

**Application of phytohormones to vegetative reproduction in plants** [trans. title], G. Covas (*An. Inst. Fitotec. Santa Catalina, 1 (1939), pp. 181–186, figs. 3; Eng. abs., p. 186*).—Satisfactory results are reported from treatments with commercial hormones and with heteroauxin, and a marked root proliferation was also obtained in cuttings and branches of *Buxus sempervirens, Gardenia jasminoides, Pereskia sacha-rosa, Podocarpus parlatorei, Hydrangea opuloides, Medicago sativa, Fabiana imbricata, Dianthus* sp., *Thunbergia* sp., and *Coleus blumei*. For the first time it was made possible to obtain vegetative propagation in *Podocarpus parlatorei* and *Fabiana imbricata*, two native plants deemed worthy of cultivation.

**Manual of cultivated trees and shrubs hardy in North America, exclusive of the subtropical and warmer temperate regions**, A. Rehder (*New York: Macmillan Co., 1940, 2. ed., rev. and enl., pp. XXX+996,* [*pl. 1*]).—This new and enlarged edition of the manual previously noted (E. S. R., 57, p. 142) was made necessary by the many new species and varieties brought into cultivation, the new hybrids that have appeared, and the many changes in nomenclature. The number of species appearing in the keys and fully described now amounts to 2,550 instead of 2,350, and the number of varieties and hybrids and of species only briefly described has grown accordingly.

## FORESTRY

**[Forestry investigations by the Ohio Station]** (*Ohio Sta. Bul. 600 (1939), pp. 69–75, figs. 5*).—Included are reports on activities relating to the use of State forests as recreational areas; acquiring new State forests; forest fire protection; role of farm woodlands in soil conservation; hillcultural studies; and the effective utilization of hardwoods as to sites and species mixtures.

**State forests for public use** (*U. S. Dept. Agr., Misc. Pub. 373 (1940), pp. IV+86, figs. 32*).—Information is presented on the number and distribution of State forests, legislation concerning their establishment, protection activities on the forests, benefit of the forest recreational activities, watershed protection, production of lumber and other products, management of the forests and construction of buildings, and planning of State forest programs.

**The North Fork infiltrometer, an instrument for measuring the infiltration capacities of soils**, P. B. Rowe. (U. S. D. A. and Univ. Calif). (*Jour. Forestry, 38 (1940), No. 7, pp. 588, 589, fig. 1*).—Information on the origin, structure, and use of an instrument found economical and practical for measuring the infiltration capacity of soils under natural conditions.

**The Hebo pruning club**, T. Kachin. (U. S. D. A.). (*Jour. Forestry, 38 (1940), No. 7, pp. 596, 597, figs. 2*).—A tool consisting of a mattock, hazel hoe, grub hoe, or pick handle shod on the end with a piece of ⅛-in. steel was found useful for the close and rapid pruning of pole and piling size trees. Preliminary studies indicated that the tool is appreciably faster than any pruning saw, whether used from the ground, ladder, or in spur climbing.

**Forest-site quality studies in the Adirondacks.—I, Tree growth as related to soil morphology**, R. L. Donahue ([*New York*] *Cornell Sta. Mem. 229 (1940), pp. 44, figs. 36*).—Employing a technic in which there were selected widely different virgin stands having several commercially important species in common and then examining the soil supporting these trees, as well as recording the tree growth, the author concludes that if one may accept height growth at maturity as a good index to site quality then (1) the hardwood type

is the most favorable for sugar maple, beech, and yellow birch; (2) the spruce-hardwood type is the most favorable for spruce and balsam fir; and (3) northern white cedar makes its best development on the spruce flat type. Based on total height at maturity, the general productivity level is therefore hardwood > spruce-hardwood > spruce flat > spruce swamp.

On comparing the specific gravity of each species (average of sapwood and heartwood) on the different forest types, no consistent relationship was found. Sugar maple and balsam were both slightly heavier when growing on the spruce-hardwood type, while yellow birch was heavier on the hardwood type. Spruce produced heavier wood on the spruce flat, and balsam fir had a higher specific gravity in the spruce swamp. However, none of the differences exceeded 0.06. Total cubic feet for all species by forest types agreed with the original hypothesis that the productivity level is hardwood > spruce-hardwood > spruce flat > spruce swamp. Measurements of light intensity by a Weston sunlight meter on the forest floor and at 3- and 6-ft. elevations led to the general conclusion that light intensity in the forest is inversely proportional to site quality. Studies of the sites showed all the hardwood plats to have a southerly exposure, and all the spruce-hardwood plats to have a northerly exposure. As to the soil, there was practically no difference in mechanical analysis between the different forest types, particularly in the finer soil fractions. Soil pH values were apparently the highest on the hardwood forest type and lowest on the spruce flat type. The most acid soil was the spruce flat type, which contained mostly coniferous trees with leaves of low Ca content.

Nineteen root charts were made, representing the four forest types. The root numbers were then summarized by soil horizons and by five size classes. In the hardwood and spruce swamp forest types, the number of roots per square foot of rock-free soil horizon decreased with increasing depth below the surface. In the other forest types, however, the soils exhibited a gray leached zone in which the roots showed a decided decrease in number.

The application of the observations to forest management is discussed.

**Influence of root-pruning after digging on the growth of certain hardwoods, L. F. Smith.** (Kans. Expt. Sta.). (*Jour. Forestry, 38 (1940), No. 7, pp. 600, 601*).—After pruning to various degrees, 1-year-old seedlings of hardy catalpa, green ash, hackberry, black locust, and American elm were planted in April 1938 2 ft. apart on the square. When dug in the autumn of 1938, measurements showed that root pruning had not significantly affected the amount of top growth of catalpa, ash, or locust but had definitely reduced the amount of growth in hackberry and American elm.

**Propagation of black locust clones by treating hardwood cuttings with growth substances, V. T. Stoutemyer, J. R. Jester, and F. L. O'Rourke.** (U. S. D. A.). (*Jour. Forestry, 38 (1940), No. 7, pp. 558–563, figs. 2*).—The black locust is said to be a variable species including numerous distinct forms, such as the shipmast locust. Propagation by hardwood cuttings is a highly desirable method of increasing trees, but is attended with difficulties in most hardwoods. The authors found that the common black locust and its varieties may be grown from hardwood cuttings planted directly in soil following a treatment with an aqueous solution of 100 mg. per liter of indoleacetic acid or α-naphthaleneacetic acid applied at the basal ends of well-callused cuttings for 24 hr. A period of storage of the cuttings at 70° F. following treatment is recommended to allow the root primordia to form under favorable conditions. Survival of cuttings in successful field plantings reached 69 percent, and excellent plants were produced. Over 90 percent rooting was often obtained under greenhouse conditions.

**Vegetative propagation of Norway spruce,** C. G. Deuber and J. L. Farrar (*Jour. Forestry, 38 (1940), No. 7, pp. 578–585, figs. 6*).—Dormant Norway spruce cuttings taken from 39-year-old trees were rooted successfully in the greenhouse during a period of 3 mo. Time of collection was very important in rooting, success increasing from October to November and attaining a high point in December. Cuttings over 4 in. long were superior to shorter ones. A heel of old wood had an inhibiting influence on rooting. Treatment with indolebutyric acid solutions was of no benefit, being surpassed by direct planting in sand. Soaking the bases of cuttings in tap water for 24 hr. retarded rooting. Rooted cuttings were successfully transferred to outdoor nursery beds in April and May.

**Successful direct seeding of northern conifers on shallow-water-table areas,** J. H. Stoeckeler and A. W. Sump. (U. S. D. A. and Univ. Minn.). (*Jour. Forestry, 38 (1940), No. 7, pp. 572–577, figs. 2*).—Despite the fact that in most instances direct seeding of conifers on cut-over lands has not proved satisfactory, the authors believe that there are certain sites which offer favorable possibilities. Successful direct seeding of jack pine was accomplished in a severe drought year in open sand plains where there was a permanent water table at a depth of 1.5–5 ft. Sowings between April 16 and May 7 gave higher initial stands than later seedings. Spring seeding proved better than autumn for jack pine. The best and most economical results were secured with 0.25–0.5 lb. of jack pine seed per acre planted in furrows prepared the preceding summer. Fairly good results were secured in the direct seeding of red and white pines, white and black spruce, and European larch. Mixtures of red and jack pine and of black spruce and European larch also gave good results.

**Growth studies of southern white cedar in New Jersey,** E. B. Moore and A. F. Waldron (*Jour. Forestry, 38 (1940), No. 7, pp. 568–572*).—Measurements taken in a series of permanent sample plats laid out in the winter of 1927–28 in white cedar stands on the Lebanon State Forest, N. J., which had been recently thinned to different degrees of severity—medium, which removed one-third of the basal area, and heavy, with 53 percent removed—showed at the end of 10 yr. that moderate thinning is the better practice. Mortality in the check plats ranged from 36 to 50 percent, and in the thinned plats from 2 to 6 percent. Differences in height growth between plats were negligible. In New Jersey it is believed that thinning in white cedar stands is justified only on 45-ft. sites or better and in stands where the stocking is at least 200 sq. ft. per acre. Presumably, this condition is not generally reached before 45 yr. of age. Thinnings should be of medium intensity, removing from 35 to 40 percent of the basal area. Trees of bean-pole size should be simply lopped, without attempting salvage.

**Some notes on lateral growth of jack pine crowns,** T. Schantz-Hansen. (Univ. Minn.). (*Jour. Forestry, 38 (1940), No. 7, pp. 598–600*).—Measurements of crown spread in 40-year-old jack pine showed little relationship between number of trees and crown density. Measurements of crown spread in thinned plats and check plats showed that thinned plats had not reached the probable crown density attained before thinning. Measurements of lateral growth of crowns in five locations in Minnesota showed an exceedingly slow rate of growth. Further studies are said to be needed to solve the problem of what constitutes a closed stand and how rapidly it can be brought about after the stand is opened.

**Longevity of ponderosa pine,** F. P. Keen. (U. S. D. A.). (*Jour. Forestry, 38 (1940), No. 7, pp. 597, 598*).—A careful ring count on a sound stump section of a tree felled in Klamath County, Oreg., showed the tree to be 726 yr. old.

This was the oldest tree recorded, with another 714 yr. next in order. The oldest trees were slow-growing, were located on relatively poor-quality sites, and had been exposed to many forest fires.

## DISEASES OF PLANTS

**The Plant Disease Reporter, [June 1 and 15, 1940]** (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 24 (1940), Nos. 10, pp. 189–208, figs. 1; 11, pp. 209–231, figs. 2*).—The following items of interest to phytopathology are included:

*No. 10.*—*Acer* section of revised plant disease check list, by F. Weiss; *Rehmiellopsis bohemica* needle blight of balsam fir in Maine, by A. M. Waterman and K. F. Aldrich; three new locations for the *Ceratostomella* sycamore (planetree) disease, by P. V. Mook; gray bulb rot (*Rhizoctonia tuliparum*) and *Botrytis* blight on tulips, by C. Westcott; *Rhizoctonia solani* on strawberries in transit, by I. H. Crowell; and reports on cereal diseases in Virginia and Texas.

*No. 11.*—Relative prevalence and geographic distribution of various ear rot fungi in the 1939 corn crop, by P. E. Hoppe; *Botrytis cinerea* blight of flax in California, by B. R. Houston; *Botrytis cinerea* in California flax fields, by W. W. Mackie; reports on diseases of small grains in Virginia, Arkansas, Iowa, and Nebraska; reports on tobacco diseases, including red rot and downy mildew in Massachusetts, downy mildew in Connecticut, first serious outbreak of downy mildew in Pennsylvania, and widespread appearance of wildfire, downy mildew and bacterial leaf spots in Kentucky, downy mildew in Tennessee, and severe attack of downy mildew in North Carolina; brief reports on the effectiveness of cottonseed treatment in Arkansas, and downy mildew on hops in New York; notes on diseases of ornamental plants in southern California, by P. A. Miller; *Mycosphaerella citrullina* on ornamental gourds (*Cucurbita pepo*), by K. Longrée; strawberry dwarf in Massachusetts and New York; other reports on fruit diseases, including apple and peach diseases in Massachusetts, fruit diseases in New York, fire blight in Nebraska, fruit diseases not important in Arkansas, parts of lamina missing from fig leaves in Texas, and *Botrytis* sp. on strawberries in transit; halo blight of beans in Florida, by L. O. Gratz; rolling of tomato leaves, strongly suggesting curly top, in Texas, by P. A. Young; and brief notes on diseases of ornamentals in Massachusetts, some new plant disease records from Nebraska (leaf curl of chokecherry and near wilt of peas), potato production in Utah threatened by the bacterial ring rot, bacterial ring rot in New York, downy mildew on spinach in New York, and drought injury to trees in Nebraska.

**Bureau of plant pathology [report]**, D. G. Milbrath (*Calif. Dept. Agr. Bul., 27 (1938), No. 6, pp. 765–777*).—Brief reports on work with storage troubles of apples, chestnut blight eradication, control of western celery mosaic, tuberose bulb treatments for root knot, control of spotted wilt of lettuce, peach mosaic eradication, peach mosaic State-wide survey, grape disease resembling the formerly prominent California vine disease, seed potato diseases, laboratory diagnoses and summary of causes of plant diseases on specimens received, white pine blister rust, *Coryneum* canker of cypress, gardenia canker, date palm decline, citrus psorosis, hop downy mildew, and sugar beet nematodes.

**[Studies in plant pathology]**, P. L. Guest, G. K. Parris, J. E. Welch, K. Kikuta, [M.] Matsuura, H. F. Clements, [L.] Machlis, and H. G. Heggeness (*Hawaii Sta. Rpt. 1939, pp. 57, 58, 69–74, 77, 78*).—Brief reports are included on the following: The results of a foliar diagnosis of chlorotic and nonchlorotic

macadamia trees, virus disease of papaya, bean rust, virus of yellow spot of pineapple on tomatoes, nematodes on potatoes and early blight of potatoes, bordeaux toxicity, damping-off control, seasonal list of fungus diseases in Hawaii, and arsenic toxicity to Sudan grass and bush bean.

**[Report of the pathology department]**, J. P. MARTIN (*Hawaii. Sugar Planters' Assoc. Proc., 59 (1939), Expt. Sta. Com. Rpt., pp. 28–38*).—Progress reports are given on foreign cane diseases; sugarcane quarantine, plantation inspection, and consultation services; potato nematode infestation; and sugarcane diseases in Hawaii (brown stripe, chlorotic streak, *Helminthosporium sacchari* eye spot, leaf scald, stem galls induced by the green leafhopper and soil extracts, mosaic, red rot, red stripe, root rots, and physiological disorders.

**[Phytopathological work by the Kentucky Station]** (*Kentucky Sta. Rpt. 1939, pt. 1, pp. 31, 32, 35–38*).—Reports of progress are given on phony peach disease eradication (coop. U. S. D. A.); and on tobacco diseases, including control of wildfire and angular leaf spot in plant beds, experimental production of blackfire, relation of stomata to wildfire infection, low soil fertility predisposing to leaf spot diseases, blackshank spread by drainage water, mosaic damage in 1939, field tests of mosaic-resistant dark fired tobaccos, tests of mosaic-resistant Burley hybrids, *Fusarium* wilt-resistant Burley tobacco, tobacco streak in relation to a similar virus disease in sweetclover, and blue mold (downy mildew) during the past 3 yr. in the State.

**[Plant disease studies by the Ohio Station]** (*Ohio Sta. Bul. 600 (1939), pp. 20–24, 25, 75, 76, figs. 3*).—Progress reports are included on development of new sprays for fruit diseases; disease control for tomatoes, cucurbits, and other vegetables; fixed copper substitutes for bordeaux mixture; bacteriophage as a factor in disease resistance; roguing and selection for control of *Verticillium* wilt of chrysanthemums, tree disease control, including *Verticillium* on elms and maples, and virus phloem necrosis of elms; and white pine blister rust control.

**[Plant disease studies by the South Carolina Station]**, G. M. ARMSTRONG, C. C. BENNETT, C. C. MILEY, W. B. ALBERT, W. B. KELLER, C. H. ARNDT, G. W. BOOZER, E. E. HALL, J. R. MATTISON, J. M. JENKINS, JR., W. C. BARNES, and C. J. NUSBAUM. (Partly coop. U. S. D. A. et al.). (*South Carolina Sta. Rpt. 1939, pp. 65–71, 72–76, 137–140, 173, 174, 176, 185–189, figs. 7*).—Progress reports are given on cotton wilt-variety tests, cross-inoculation experiments with *Fusarium* strains from cotton and Burley tobacco, mineral nutrition and wilt resistance of wilt-susceptible and wilt-resistant cotton varieties, cotton varietal selection for wilt resistance and fiber quality, seed treatment for cotton seedling diseases, disribution of the anthracnose fungus on the cotton plant, cotton disease survey, tests for controlling tobacco blue mold or downy mildew, varietal tests with downy mildew of cucumbers, fungicidal control and epidemiology of the disease on cucumbers and cantaloups, and fungicidal control of anthracnose on honeydew melons.

**Plant pathology**, C. D. SHERBAKOFF (*Tennessee Sta. Rpt. 1938, pp. 76–80*).—Brief reports are presented on wheat breeding for disease resistance, with special reference to scab and root rot; breeding for resistance to *Fusarium* wilts of cotton (U. S. D. A.), tomato, and tobacco; testing of hybrids and segregates for resistance to strawberry black root; breeding of red clover for resistance to diseases; host specialization in root knot nematodes; testing of the newer "insoluble" copper fungicides; field tests for resistance to tomato leaf diseases; and testing of lots of apple trees for reactions to black root rot.

**[Plant disease work by the Wyoming Station]** (*Wyoming Sta. Rpt. 1939, pp. 6–8, 38, 39*).—Progress reports are included on the control of psyllid yellows

or purple top in potatoes; varietal reactions and control tests with common and halo blight of beans; ferric phosphate control of chlorosis in cottonwood trees; control of diseases of potatoes; and yields of garden pea varieties in relation to various disease control treatments.

**Cytological basis of killing plant tumors by colchicine,** H. Dermen and N. A. Brown. (U. S. D. A.). (*Jour. Hered., 31 (1940), No. 4, pp. 197–199, figs. 2*).—This is a preliminary report of studies indicating the response to lie in an increase in nuclear and cell volume, and final disintegration, shriveling, and drying up of the bacterially induced tumor.

**The effects of carcinogenic substances on plants (preliminary contribution)** [trans. title], J. Kisser (*Ber. Deut. Bot. Gesell., 75 (1939), No. 10, pp. 506–515*).—This is a review, with 23 references.

**Unusual chytridiaceous fungi,** F. K. Sparrow, Jr. (*Mich. Acad. Sci., Arts, and Letters, Papers, 24 (1938), pt. 1, pp. 121–125*).—Many algae (Chlorophyceae and Heterokontae) are frequently attacked by fungi belonging to the Chytridiales. Some algae, when first invaded, appear to be healthy, but in others unmistakable signs of moribundity are visible, and the extraneous fungus is probably weakly if at all parasitic. Certain of these "chytrids" may also be induced to live on boiled filaments of their apparent hosts, and of these it can be said definitely that they are capable of living saprophytically. *Diplophlyctis laevis* and two species of *Rhizophidium* are the chytrids here dealt with.

**A note on the status of the generic name Urocystis,** G. L. Zundel, J. A. Stevenson, C. M. Tucker, D. S. Welch, and E. West (*Phytopathology, 30 (1940), No. 5, pp. 453, 454*).

**The chemistry of resistance of plants to Phymatotrichum root rot.—V, Influence of alkaloids on growth of fungi,** G. A. Greathouse and N. E. Rigler. (Tex. Expt. Sta.). (*Phytopathology, 30 (1940), No. 6, pp. 475–485*).—Continuing their investigation of resistance (E. S. R., 83, p. 203), the authors report studies of 62 alkaloids from 15 families and 50–70 plant species differing in susceptibility to *P. omnivorum* relative to their influence on its growth. The comparative influence of 6 alkaloids on 6 fungi other than *P. omnivorum* was also determined. Sanguinarine proved the most toxic alkaloid studied, completely inhibiting growth of *P. omnivorum* at a concentration of 2.5 p. p. m. In general, the relative toxicity of the alkaloids to the *Phymatotrichum* root-rot fungus followed the relative resistance rating of the plant from which isolated.

**Experimental Phymatotrichum root rot of retama and corn,** G. M. and M. O. Watkins. (Tex. Expt. Sta.). (*Bul. Torrey Bot. Club, 67 (1940), No. 6, pp. 489–501, figs. 27*).—Young retama (*Parkinsonia aculeata*) and corn seedlings grown aseptically in vitro and inoculated with sclerotia from pure cultures of *Phymatotrichum omnivorum* were readily infected, although these plants have been reported as immune against infection by this fungus at maturity in the field. Histological study of roots of both species in various stages of infection indicated widespread degeneration of cell walls and protoplasts in advance of actual hyphal penetration. The disorganization and collapse of host cells in this manner proceeded from the epidermis inward, finally resulting in breakdown of the entire cortex. In advanced stages the hyphal network was found in the central cylinder.

**Rootrots of cereals** (*Canada Dept. Agr. Pub. 699 (1940), pp. 4, fig. 1*).—An informational leaflet.

**Bacterial wilt resistance and genetic host-parasite interactions in maize,** R. E. Lincoln. (Iowa Expt. Sta.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 4, pp. 217–239, figs. 5*).—Passage of stock or single-cell cultures of *Phytomonas stewartii* through susceptible inbred lines of corn decreased their virulence,

whereas passage through resistance lines increased it. Single-cell colonies from an old stock culture indicated it to be composed of many variants differing in virulence. Successive passages of this stock culture through susceptible corn decreased the proportion of virulent variants, whereas passage through resistant lines increased it. When mixtures of known proportions of virulent and avirulent bacteria were inoculated into corn, a differential selection for the virulent type in the resistant host and for the avirulent type in the susceptible host followed. The rate and direction of this change in virulence are thus functions of both host resistance and bacterial virulence. After growth in nutrient broth, mutation in colony color and type occurred at rates of 1 in 20,000 to 1 in 800,000 cells. Both increases and decreases in virulence were also found. It is concluded that mutation and selection alone are capable of effecting the observed changes in virulence of this pathogen—mutation providing the variation while the microenvironment of the host is a directional selective agent. There are 22 references.

**Host selection by Uromyces graminis** [trans. title], E. Gäumann (*Ber. Deut. Bot. Gesell., 58 (1940), No. 2, pp. 92–96*).—The host selectivity of physiologic races of the rust fungus *U. graminis* is tabulated and discussed.

**[Wheat diseases]** (*6. Hard Spring Wheat Conf., Minneapolis, 1939, Rpt., pp. 58–65, 68*).—The following are of interest to disease problems for wheat: Results From Disease Garden and Root Rot Studies at University Farm, St. Paul, Minn., by E. W. Hanson (U. S. D. A.); What Is Known About Wheat Scab and What Can Be Done About It, by J. J. Christensen, and Seed Treatment, by M. B. Moore (both Minn. Expt. Sta.); Uniform Bunt Nursery, by J. A. Clark, and Results From Leaf Rust Studies, by M. N. Levine (both U. S. D. A.); Distribution and Importance of Physiologic Strains of Stem Rust, by E. C. Stakman (Minn. Sta. and U. S. D. A.); and Disease Problems.

**Barberry eradication**, G. C. Mayoue (Coop. U. S. D. A.). (*North Dakota Sta. Bimo. Bul., 2 (1940), No. 5, pp. 5–7, figs. 2*).—A general discussion of black stem rust of cereals in relation to the barberry host, and a progress report on barberry eradication in North Dakota, begun in 1917.

**Reaction of winter wheat varieties to loose smut infection at Texas Substation No. 6, Denton, Tex., 1938 and 1939**, I. M. Atkins (*U. S. Dept. Agr., Bur. Plant Indus., pp. 4*).

**The dissemination of the spores of loose smut of wheat (Ustilago tritici) through the air**, A. J. P. Oort (*Tijdschr. Plantenziekten, 46 (1940), No. 1, pp. 1–18, pl. 1, figs. 2; Eng. abs. pp. 16–18*).—Evidence from the two experiments reported indicates that *U. tritici* spores may be disseminated and cause infection for at least 100 m. from the point of origin. In winds of high velocity the dissemination occurred almost in a horizontal plane and the infection was heavy but regularly diminishing with distance from the source of the spores. In winds of low velocity vertical air currents were associated. In this case infection was, in general, much less and showed smut islands alternating with more or less smut-free spots.

**Summary of the Great Plains uniform winter wheat bunt nursery, 1939**, H. A. Rodenhiser and K. S. Quisenberry (*U. S. Dept. Agr., Bur. Plant Indus., 1940, pp. 3*).—A summary of data obtained in 1939, together with averages for the varieties grown during different periods, 1932–39.

**Results from the uniform bunt nurseries in the western region in 1939, with averages for 1938**, C. S. Holton and C. A. Suneson (*U. S. Dept. Agr., Bur. Plant Indus., 1940, pp. 2*).—Seed of 28 varieties and hybrid selections of winter wheat was inoculated and sown in 10 localities in the 1938–39 season to determine their reactions to bunt other than the "dwarf" race of *Tilletia tritici*,

and noninoculated seed was sown at 3 places to determine the reactions of the varieties to the last-named race. The resulting data are tabulated and discussed.

**Studies on oat blast,** T. Johnson and A. M. Brown (*Sci. Agr., 20 (1940), No. 9, pp. 532–550, figs. 4*).—Evidence is presented that the amount of blast is readily influenced by the nutritional conditions of the oat plant from the time the spikelets are initiated until just before emergence of the panicle. Any influence adverse to normal nutrition during this period tended to increase the amount of blast. At this growth stage the amount was experimentally increased by reducing the water supply, withholding certain mineral nutrients, artificially injuring the leaves, leaf injury due to rusts, and growing the plants under progressively diminishing day length. Field tests relative to the influence of date of sowing on blast incidence (1934–39) indicated that in some varieties there is a tendency for early sown oats to have a lower incidence than oats sown later. Data over a 3-yr. period showed that the yield per acre is highest for the earliest date of sowing and progressively decreases with later sowings. This decrease in yield was accompanied by a diminution in panicle size and frequently by an increase in the percentage of blasted spikelets. The yield decreases appeared to be largely the consequence of diminished vigor of growth, though the higher incidence of blasted spikelets was perhaps also a contributing factor.

**Occurrence of a disease of side-oats grama,** R. L. Fowler and J. E. Weaver (Univ. Nebr.). (*Bul. Torrey Bot. Club, 67 (1940), No. 6, pp. 503–508, figs. 3*).—The beginning of this disease of *Bouteloua curtipendula* was first observed in 1937 but reached alarming proportions in 1939. The fact that this grass has increased during the past 6 yr. from a rank of seventh or eighth among dominants of true prairie to one of the two or three most important species adds unusual economic interest. Furthermore, it has a wide distribution, is one of the most drought-resistant among the best grasses for rejuvenating depleted pastures and reseeding abandoned lands, and is being grown abundantly in grass nurseries of the U. S. D. A. Soil Conservation Service. For these reasons the authors give a rather complete account of its occurrence and increase. The disease symptoms, based on field observations, include the appearance in early spring of rosette-like clumps or portions of bunches containing large numbers of tillers. These plants do not elongate normally, and the stem bases develop a distinctly reddish color. The leaves are dwarfed to one-third or less of their usual width. The general appearance suggests the virus mosaic disease of wheat. The leaves are yellowish and turn brown after death. Where there are any, the flower stalks are markedly reduced in number and attain only about two-thirds their normal height. Whether this disease is due to insect damage, fungi, bacteria, a virus, or to physiological conditions only is as yet unknown. Whatever the cause, it is believed reasonable that the extreme conditions resulting from the years of drought may have been a contributing factor.

**The occurrence of Helminthosporium turcicum in the seed and glumes of sudan grass,** S. J. P. Chilton. (U. S. D. A. et al.). (*Phytopathology, 30 (1940), No. 6, pp. 533–536, figs. 1*).—*H. turcicum* was isolated from surface-sterilized seed or glumes of 21 out of 52 lots of Sudan grass seed, the percentage ranging from 1 to 20 with seed and from 1 to over 50 with glumes. The fungus was still viable in seed lots nearly 2 yr. old. Surface sterilization with $HgCl_2$ (1–1,000) for 1 hr. greatly reduced the number of infected seed without seriously affecting germination. Infection somewhat reduced germination.

**Variation in pathogenicity and cultural characteristics of the cotton-wilt organism, Fusarium vasinfectum,** G. M. Armstrong, J. D. MacLachlan, and R. Weindling. (S. C. Expt. Sta.). (*Phytopathology, 30 (1940), No. 6, pp. 515–*

*520, figs. 2*).—Thirteen single-spore cultures were grown on nonacidified potato-dextrose agar at 28° C., and 17 successive transfers were made, each time 3–6 single spores from each culture being transferred to agar in petri dishes to distinguish variants as they appeared. Of the 13 isolates, 11 exhibited variation in cultural characteristics, and in the 2 directions of less aerial mycelium and a slower rate of growth. No variant studied reverted to the parent type. Fifteen of the single-spore isolates were used to infest soil in pots in which a susceptible variety and resistant varieties of cotton were grown, an average of 25 plants being used for each isolate and cotton-variety combination during each of 2 yr. Results were noted as regarded external and internal symptoms, and reisolation of the fungi. Isolates long in culture proved decidedly less pathogenic than those of recent origin, and some variants were markedly less pathogenic than the parent, while others varied little. A single passage of an isolate through the host failed to modify its pathogenicity. The high percentage of reisolation from resistant cotton varieties showing no external symptoms suggests that the mechanism of resistance is not involved in the process of infection. It is believed that variants of *F. vasinfectum* differing in pathogenicity may occur in the field.

**Disease resistance tests and seedling selections in 1938 and 1939,** R. D. Rands, E. V. Abbott, and E. M. Summers. (U. S. D. A.). (*Sugar Bul., 18 (1940), No. 15, pp. 5–9*).—This reviews the disease development in commercial and test-field varieties of sugarcane, and summarizes disease resistance and other tests enabling the selection of C. P. numbers among the many new seedlings received since the last report at the U. S. Sugar Plant Field Station, Houma, La. (E. S. R., 80, p. 500). A partial acreage census of commercial varieties is included for better evaluation of the present disease situation.

**A chytrid in relation to chlorotic streak disease of sugar cane,** C. W. Carpenter (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 44 (1940), No. 1, pp. 19–33, figs. 12; abs. in Science, 91 (1940), No. 2364, pp. 382, 383*).—The intracellular chytrid fungus discussed in this preliminary paper apparently has not hitherto been observed, nor did a brief search of the available literature reveal any species closely resembling the various phases of its life cycle observed in many varieties of sugarcane and here described and illustrated. The history of chlorotic streak, its symptomatology, etiological studies, and current observations are also discussed and presented as a progress report, which may serve as an introduction to the etiology of the disease. "Whether the chytrid described is the agent causing the symptoms may not be as significant as that this intracellular parasite, apparently hitherto unknown, may, in the absence of any gross symptoms, contribute to growth depression, poor germination, and thin stands of cane in plant and ratoon crops, and the deterioration of mature cane, in localities where wet conditions prevail."

**Diseases of tobacco in Canada,** G. H. Berkeley and L. W. Koch (*Canada Dept. Agr. Pub. 667 (1940), pp. 29, figs. 19*).—A handbook.

**Further experiments on control of downy mildew,** P. J. Anderson (*Connecticut [New Haven] Sta. Bul. 433 (1940), pp. 166, 193–206, figs. 9*).—Reporting further progress (E. S. R., 83, p. 354) on the control of *Peronospora tabacina*, detailed experimentation indicated the great importance and some of the difficulties in obtaining and keeping the proper concentration of benzol gas necessary. Wet cloth covers were found much more effective in confining the air than the glass sash commonly in use, but wet cloth over the top and edges of the glass sash also proved satisfactory. In comparing cloth covers with 56 by 60 and 80 by 80 threads to the inch, the thicker quality increased the gas concentration maintained throughout the night but both produced concentrations

well above the safety point for effective control. Sprinkling the glass sash increased the concentration, provided the wind did not dry off the moisture during the night. Glass sash covered with wet cloth proved most independent of wind effects. Variations in air temperatures commonly encountered in the Connecticut region were apparently not of great importance so far as benzol control was concerned. The evaporation surface ratio, the volume of benzol needed, the time and frequency of application, and the use of wick evaporators are discussed, and brief notes on more limited tests of paradichlorobenzene control are included.

***Toxicity of paradichlorobenzene in relation to control of tobacco downy* mildew**, J. A. PINCKARD, R. McLEAN, F. R. DARKIS, P. M. GROSS, and F. A. WOLF. (Va. Expt. Sta. et al.). (*Phytopathology, 30 (1940), No. 6, pp. 485–495, figs. 2*).—A quantitative method permitting joint medication of host and parasite (*Peronospora tabacina*) under controlled environal conditions was used in this study. The minimum concentration of paradichlorobenzene vapor fungicidal to downy mildew was 0.01–0.02 volume percent, equivalent to saturation pressures at 0°–7° C. For effective fungicidal action, 3–4 consecutive treatments within this range were requisite, a single application not eradicating the parasite. The maximum concentration tolerated by tobacco seedlings for a single 12-hr. fumigation was ±0.0375 volume percent, equivalent to saturation at 12°. Temperature is also an important factor in delimiting the concentration of vapor obtainable. Further evidence is presented to show that paradichlorobenzene vapor acts as an eradicant fungicide without appreciable injury to the host. The concept of penetrant fumigants is developed and its implications are discussed.

**The use of paradichlorobenzene in seedbeds to control tobacco downy mildew**, R. McLEAN, J. A. PINCKARD, F. R. DARKIS, F. A. WOLF, and P. M. GROSS. (Va. Expt. Sta. et al.). (*Phytopathology, 30 (1940), No. 6, pp. 495–506, fig. 1*).—Applied either on successive nights or over longer intervals between successive applications, paradichlorobenzene has given satisfactory control of downy mildew in tobacco seedbeds. The authors regard it as an effective fungicide against this disease when employed under the following conditions: The proper amount to use is 1.5–3 lb. per application per seedbed area of 100 sq. yd. The crystals should be distributed widely on the loose-texture cloth ordinarily used for seedbed covers. Sheeting of ±60 threads each way per inch should be used as a covering during fumigation. Under seedbed conditions temperatures above 7° C. are necessary for sufficient vaporization to maintain effective vapor concentrations. Moisture on the seedbed covers is desirable to aid in retaining effective concentrations of vapor within.

**The prevention of brown rootrot and black rootrot of tobacco in Canada**, L. W. KOCH and R. J. HASLAM (*Canada Dept. Agr. Pub. 700 (1940), pp. 4, figs. 2*).—An informational leaflet.

**Frenching of tobacco distinguished from thallium toxicity by spectrographic analysis**, G. M. SHEAR and H. D. USSERY. (Va. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 2, pp. 129–139, pl. 1*).—Spectrographic analyses of ash from healthy, frenched, and thallium-treated tobacco plants disclosed thallium only in those grown in nutrient solutions containing it. Thallium could be detected in ash samples in amounts of less than 0.0001 percent and in ash samples from plants receiving 0.016 p. p. m. in the nutrient solution—too minute to cause toxic symptoms. Thallium is fixed in the tissues in such a way as to produce a gradient, decreasing from roots to youngest leaves. The plant therefore must have a continuous supply if toxicity symptoms are to appear on the new growth. Gallium appeared to have no relationship with frenching or thallium toxicity.

**Potato diseases and their control,** O. D. Burke (*Pa. State Col. Ext. Cir. 218 (1940), pp. [2]+30, figs. 15*).—A handbook of information on potato diseases, with general and specific control measures, and identification key to the diseases.

**Potato production in Utah threatened by bacterial ring rot,** B. L. Richards (*Farm and Home Sci. [Utah Sta.], 1 (1940), No. 2, p. 5, fig. 1*).—This is a general statement concerning this disease and its distribution in the United States since first found in Maine in 1933. During 1939 it was located in 10 Utah counties, and it is believed definitely possible that it will be found in every potato district in the State into which seed has been imported from outside areas.

**Rôle of peroxidase in immunity against Phytophthora infestans de Bary,** A. I. Grechushnikov (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 25 (1939), No. 8, pp. 683–687*).—On infection, potato varieties resistant to *P. infestans* exhibited dark necroses and higher peroxidase activity than susceptible sorts. When factors unfavorable to resistance came into play (e. g., increased humidity and short days), the peroxidase activity decreased. Furthermore, changes in the cystoamylase (cytoamylase?) values paralleled those in the peroxidase values. It is claimed that under similar growing conditions the resistance of a potato plant to *Phytophthora* may be safely based on the cystoamylase and peroxidase indexes.

**Aphids and their significance as virus vectors on beets and potatoes** [trans. title], S. G. Larsson (*Tidsskr. Planteavl., 45 (1940), No. 1, pp. 97–139*).—A general discussion of the subject, with 14 references.

**Relation of boron to heart rot in the sugar beet,** T. R. Cox. (Mich. Expt. Sta.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 5, pp. 354–370, figs. 3*).—Seedlings grown in jars without borax developed characteristic deficiency symptoms, viz, blackening of tips of heart leaves, followed by death of the crown; shortening and twisting of the petioles associated with crinkling of the heart leaves and some of the outer leaves; abnormally dark green and thicker leaves, accompanied by more rapid wilting under deficient water supply; pimpled condition of the petioles in early stages, followed by cross and linear checking; yellowing and final death of the outer leaves, following death of the heart leaves; stunted second-growth leaves after the death of the first leaves; breakdown of the heart of the root; darkening of the layer under the skin of the root and development of surface cankers in advanced stages; and restriction of the fibrous root system. The available B of the quartz sand and seed was adequate to prevent deficiency symptoms for 2 mo. after transplanting. Root yields were increased as much as 80 percent by applying 11.9 mg. of borax per 5 kg. of sand in divided applications. Seedlings in advanced stages of heart rot recovered definitely on application of 4.9 mg. of borax per pot. Halves of field-grown mother beets planted in quartz sand cultures without borax produced stunted leaves with marked symptoms of B starvation, whereas the corresponding halves plus borax at the rate of 2 mg. per 1-gal. pot produced a more abundant leaf growth free of deficiency symptoms. Soil tests for available B showed that a crop of sugar beets in pot cultures removes an appreciable amount of B from the soil. By determining the amount of $B_2O_3$ in leachates from pot cultures it was found relatively easy to remove added borax from soils by leaching with distilled water, even a year after its application. There are 38 references.

**Borax as a control for heart rot of sugar beets,** R. L. Cook. (Mich. Expt. Sta.). (*Better Crops With Plant Food, 24 (1940), No. 5, pp. 12–16, 39–46, figs. 10*).—Borax applied to Thomas sandy loam pot cultures at the rate of 10 lb. per acre prevented heart rot, practically doubled yields, and increased the sucrose

content of the sugar beet roots. Heart rot was not prevented by Cu, Mn, or Mg, nor did they affect the yield and sucrose content. Applied broadcast in the field at rates as high as 80 lb. per acre, borax did not injure the stands or reduce the yields. Applied with the seed at the rate of 10 lb. per acre it injured the stand on one field in 1939 but did not affect the stand on seven other fields in 1938 and 1939. As much as 40 lb. per acre applied in the row did not reduce the stand on some soils. Applied in a band at the side but not in contact with the seed, borax was much less harmful to the stand than when applied with the seed. Applied broadcast or with the seed it did not significantly increase sugar beet yields. Applied as a side dressing on an area where heart rot was very severe, borax significantly increased the total sugar beet yields and more than doubled the yield of normal beets. Heart rot was almost completely prevented by borax applied in the row at the rate of 10 lb. per acre. Broadcast at the same rate it was somewhat less effective, and on one field the 20-lb. application produced significantly better results than the 10-lb. rate. Heart rot reduced the sucrose content of sugar beets. On one field the beets with heart rot had a lower percentage of purity than did normal beets.

**The action of boron on the plant with direct application of boric acid to the shoot** [trans. title], W. Maier (*Chron. Bot., 5 (1939), No. 4–6, pp. 334–336*).—According to a brief review of the results of experiments by the author and others the appearance of boron deficiency symptoms in boron-free nutrient solution can be prevented by adding boron to the shoot.

**Boron problems of apple orchards**, A. B. Burrell (Cornell Univ.). (*Mass. Fruit Growers' Assoc. Rpt., 46 (1940), pp. 137–140*).—From experiments in New York State over a 14-yr. period, together with results reported elsewhere, it is found that application of fine granular borax in a ring beneath the tips of the branches in early spring offers a cheap and dependable method of preventing internal cork even in dry years. This method has been used on some 75,000 trees in the Champlain Valley and with some variations in many orchards of the United States and other countries. Its use is suggested for entire blocks in which some internal cork has occurred. The four major symptoms of boron deficiency in apples are described, viz, internal cork, external cork, dieback, and rosette.

**Magnesium deficiency of apple trees in sand culture and in commercial orchards**, H. Hill and F. B. Johnston (*Sci. Agr., 20 (1940), No. 9, pp. 516–525, figs. 8*).—Following a review of the occurrence, symptoms, and control measures found effective for Mg deficiency, studies of the effects on the foliage and growth of Melba, Fameuse, and McIntosh apples grown in sand cultures are described and illustrated. The occurrence of Mg deficiency in commercial orchards is reported, and growth and foliage symptoms are compared with those induced in sand culture. Associated soil conditions are reported, viz, dark brown decidedly acid loams occasionally showing traces of podsolization, surface soil rich in organic matter and total N, and soils low in Ca and Mg but with a satisfactory K level. The compositions of leaves of terminal shoots from trees with typical symptoms and of those from average normal trees of the same variety were compared, the former showing a very low Mg content, a normal P and Ca level, and a somewhat higher K content than the latter. Attention is called to possible influences of Mg deficiency in increasing susceptibility to spray injury to the foliage. Soil applications of $MgSO_4$, sulfate of potash magnesia, and dolomite limestone failed to affect the Mg content of the leaf petiole or terminal shoot, or to prevent the disorder from appearing in the year of their application. There are 16 references.

**Recent developments on eradicant sprays**, H. W. Anderson. (Univ. Ill.). (*Ill. State Hort. Soc. Trans., 73 (1939), pp. 235–247*).—The author discusses the

history of eradicant sprays, their use in apple scab control, and experiments during the past season, based on the fact that scab perithecia are more easily penetrated by liquids as they approach maturity in spring and the leaves after decay during winter. It is concluded that eradicant spraying for apple scab is still in the experimental stage, and that a successful control program should be based on a material which is relatively cheap, easy to apply, and noninjurious to the tree over a period of years but toxic enough to kill most of the inoculum. The method is believed likely to be limited to fungus pathogens with a vulnerable stage in their life history. At best it is expected that only a partial control of the disease can be secured, but that certain summer sprays may be safely omitted.

**Eradicant fungicides**, A. J. Riker (*Chron. Bot., 5 (1939), No. 4–6, pp. 384, 385*).—A review of work in Wisconsin centered briefly about apple scab, and believed to indicate far-reaching potentialities for modification not only in the basic philosophy but also in the methods for control of an important group of plant diseases.

**Control of apple scab after harvest**, E. F. Guba. (Mass. State Col.). (*Mass. Fruit Growers' Assoc. Rpt., 44 (1938), pp. 234–239*).—This paper summarizes data on eradicant sprays for scab.

**Some suggestions concerning the apple spray schedule for 1940**, H. W. Anderson. (Univ. Ill.). (*Ill. State Hort. Soc. Trans., 73 (1939), pp. 345–351*).—This discussion is confined to that part of the spray schedule pertaining to disease control and spray injury, and some of the suggestions are based on the results of spray tests of the preceding summer.

**Foliage and fruit injury from spray materials**, F. J. Schneiderhan (*Mass. Fruit Growers' Assoc. Rpt., 44 (1938), pp. 81–90*).—With particular reference to apples and based on experimental work, the author discusses the factors involved in spray injury due to sulfur and to lead arsenate, chemistry of spray injury, symptoms induced on fruit and foliage, and cumulative effect of spray injury on fruit trees. Suggestions for relief from lime-sulfur injury are also given.

**Spray injury on apples, 1939 experiments**, D. Powell and H. W. Anderson. (Univ. Ill.). (*Ill. State Hort. Soc. Trans., 73 (1939), pp. 252–260*).—As a result of certain treatments in spray tests, the midseason defoliation formerly ascribed to *Physalospora obtusa* is believed to be due to lead arsenate-lime-sulfur injury rather than to fungus infection. Harvest-time data on calyx-injured fruit, defoliation, and leaf injury proved that this spray was most injurious of the treatments used on the Jonathan variety. It is assumed that Ben Davis and Gano and probably other varieties would react similarly to the same treatments. It is advised that full strength liquid lime-sulfur be not used on the three above-named varieties in Illinois. Detailed results are tabulated.

**A physiological study of soft scald in Jonathan apples**, E. V. Miller and H. A. Schomer. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 3, pp. 183–192, fig. 1*).—Conditions known to be conducive to soft scald consisted of immediate storage at 32° and 36° F., delays of 3–11 days at 65°–75° prior to storage at these temperatures, and a $CO_2$ or heat treatment following the delay but prior to storage at 32° and 36°. Fruit stored at once usually evolved small amounts of acetaldehyde during the early part of the storage. Treatment following delay increased the acetaldehyde content of the fruit. Delay at 65°–75° tended to increase the sucrose and total sugar in both juice and pulp at the beginning of storage, while the $CO_2$ treatment did not greatly influence reducing sugar and sucrose. Delay reduced the acidity of the juice at the beginning of storage, and $CO_2$ treatment had no immediate additional

effect. Lots treated with $CO_2$ showed a slightly lower acidity in November, which was about the middle of the storage period. Heating the fruit to 98.6°-104° for 1 day following an 11-day delay at 70° lowered the total acidity and pH. This lot showed less soft scald but more internal breakdown than the others. Though changes in the sugar, acid, and acetaldehyde content of apples are believed to be an index of physiological activity, no correlation was found between these substances and the occurrence of soft scald.

**Growth restriction as an aid to fire blight control,** F. S. Howlett. (Ohio Expt. Sta.). (*Amer. Fruit Grower, 60 (1940), No. 5, p. 20, fig. 1*).—Observations and experiments appear to indicate that for fire blight control provision must be made for restricting the growth of pear trees to a much greater degree than has ever been the practice in the past.

**Virus diseases of the peach,** H. H. Thornberry. (Univ. Ill.). (*Ill. State Hort. Soc. Trans., 73 (1939), pp. 247-252*).—The distribution, economic importance, and methods of spread of eight virus diseases of peaches are discussed. Only a few of them are known to occur in Illinois.

**Production of epinasty by emanations from normal and decaying citrus fruits and from Penicillium digitatum,** E. V. Miller, J. R. Winston, and D. F. Fisher. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 4, pp. 269-277, figs. 4*).—Epinasty in test plants (e. g., potato or tomato) is generally conceded to indicate ethylene in plant tissue emanations. Tested for ethylene evolution by this method, positive results were obtained with oranges, tangerines, limes, lemons, and grapefruit. Oranges and grapefruit inoculated with *P. digitatum* and oranges with stem-end decay produced epinasty in test plants sooner than normal fruits under the same conditions. Positive results were also obtained with pure cultures of *P. digitatum*.

**Notes on Botryosphaeria ribis** [trans. title], C. G. Da Luz (*Agron. Lusitana, 1 (1939), No. 4, pp. 361-372, pl. 1; Eng. abs., pp. 369, 370*).—A series of inoculations was made on several plant species, using *Dothiorella* sp. isolated from a gummed trunk of lemon from Madeira. In some cases the perfect stage developed, and was indentified as *B. ribis*. Observations indicated that size of fructifications varied according to thickness of bark of the particular host used. The various stages of the fungus are described. There are 16 references.

**Diseases of the pecan,** J. B. Demaree, J. R. Cole, H. E. Parson, and J. R. Large (*U. S. Dept. Agr., Farmers' Bul. 1829 (1940), pp. 36-70, figs. 21*).—Superseding Farmers' Bulletin 1672 (E. S. R., 66, p. 242), information is given on pecan scab (*Cladosporium effusum*), downy spot (*Mycosphaerella caryigena*), vein spot (*Gnomonia nerviseda*), leaf blotch (*M. dendroides*), brown leaf spot (*Cercospora fusca*), liver spot (*G. caryae pecanae*), powdery mildew (*Microsphaeria alni*), nursery blight (*Sphaceloma* sp.), gnomonia leaf spot (*G. dispora*), wood rots, crown gall (*Bacterium=Phytomonas tumefaciens*), rosette, little leaf, bunch disease or witches'-broom, and winter injury and sun scald. The importance of good orchard care and disease control is stressed, and spraying materials, methods, and equipment are discussed.

**Black end and anthracnose of the banana, with special reference to Gloeosporium musarum Cke. and Mass.,** J. H. Simmonds and R. S. Mitchell (*Austral. Council Sci. and Indus. Res. Bul. 131 (1940), pp. 63, pls. 2, fig. 1*).—In this monographic study *G. musarum* was found to be the most important organism with black end under Queensland conditions, it being responsible for the epidemic development of both black end and anthracnose during the months of January and February, with losses to a lesser degree at other seasons.

*Nigrospora sphaerica* may induce a similar type of black end during winter and spring, but is less serious, and *Fusarium* spp. are responsible for a minor type throughout the year. Studies of the fungi concerned, factors contributing to the two phases of the disease, and experiments directed toward control are presented in detail.

**Fruit diseases in 1937,** O. C. Boyd (*Mass. Fruit Growers' Assoc. Rpt., 44 (1938), pp. 224–230*).—A seasonal survey for Massachusetts on diseases of apples, stone fruits, and small fruits, with a summary of weather conditions.

**Fruit diseases in 1939,** O. C. Boyd (*Mass. Fruit Growers' Assoc. Rpt., 46 (1940), pp. 22–25*).—A seasonal survey of weather conditions and diseases of apples, stone fruits, and small fruits for Massachusetts.

**The dry disinfection of seed: References covering the period 1930–1939** (*Sci. Mus. [London], Sci. Libr. Bibliog. Ser. No. 499 (1939), pp. [1]+19*).

**Sprays and dusts for florists and gardeners** (*U. S. Dept. Agr., Bur. Plant Indus., pp. 4*).—An informational leaflet.

**The fixed coppers as a new weapon for use in the fight against vegetable diseases,** J. D. Wilson. (Ohio Expt. Sta.). (*Market Growers Jour., 66 (1940), No. 8, pp. 206–209, 210*).—A general survey of the fixed copper fungicides in relation to control of diseases of vegetable crops.

**Progress in the development of vegetable varieties resistant to disease,** H. A. Jones (*Chron. Bot.,5 (1939), No. 4–6, pp. 381–383*).—A review.

**A new virus disease of snap beans,** W. A. Jenkins. (Ga. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 4, pp. 279–288, figs. 3*).—An apparently new disease of snap beans in the vicinity of Experiment, Ga., is described and designated black root. The symptoms at first consist of incipient wilt of a part of the plant, followed by permanent general wilt of all the leaves, and final death. Accompanying these symptoms is an extensive vascular discoloration of the roots, stem, leaves, and pods, and the lower leaves exhibit a faint checkerboard pattern of light and dark areas. The disease was transmitted only by hypodermic injections of fresh juice from affected pods in the snap bean stage and through the seed. Thus far, insect transmission tests have given negative results, with one possible exception in which the tarnished plant bug (*Lygus pratensis*) was used. The present host range includes several varieties of bunch and pole beans and a variety of lima beans.

**Relation of the near-wilt fungus to the pea plant,** W. J. Virgin and J. C. Walker. (Idaho Expt. Sta. coop. Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 4, pp. 241–248, pl. 1, figs. 3*).—The causal fungus *Fusarium oxysporum* usually invades garden pea plants at the root tip and at the cotyledonary node, although occasionally it may enter at other points on the seedling root and epicotyl. Under some conditions a definite seedling root rot occurs, but generally the fungus progresses promptly to the xylem initials, becoming established in the larger vessels. It advances up the xylem much farther than does *F. orthoceras pisi* of common wilt. In many susceptible varieties it may travel the full length of the stem and into the pods and seeds. There is no difference in the mode of penetration of susceptible and resistant varieties, but progress up the stem is more limited in the latter. Dwarf, late-maturing varieties are much more likely to bear infected seed when grown on infested soil than are early-maturing varieties.

**A virus strain of mosaic disease of the aucuba-type in tomato,** M. I. Goldin (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 25 (1939), No. 7, pp. 630–632, fig. 1*).—The author reports finding in tomato a strain of aucuba-type virus and also the enation virus responsible for the accessory leaf blades on the lower surfaces of tobacco and tomato leaves. Detailed study of the inclu-

sions is deemed important for identifying plant viruses and, in particular, for differentiating strains as well as for studying the so-called virus mutations.

**A rot of Winter Queen watermelons caused by Phytophthora capsici,** J. S. Wiant and C. M. Tucker. (U. S. D. A. and Mo. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *60* (*1940*), *No. 2, pp. 73–88, figs. 6*).—This decay on the New York City market was found to be due to *P. capsici*, the cardinal temperatures of which in culture were 45°–47.5°, 80°–85°, and (for a 4-day period) 95°–100° F. Development of decay on artificially inoculated melons was greatest at 85°, and in 4 days lesions 2.5–3 in. in diameter developed at 63°–70°. Old lesions enlarged only slowly at 50°, although no decay was evident in melons held constantly at this temperature after inoculation and no decay developed in similar melons held at 45° for 14 days. The fungus penetrated the unbroken skin of the melon so that decay was spread by contact from melon to melon within the container. The fungus proved pathogenic for pepper plants and penetrated and rotted unwounded fruits of pepper, tomato, apple, cantaloup, cucumber, and squash, and unwounded carrot roots. It also produced rots of wounded orange and lemon fruits and wounded potato tubers. Control suggestions based on field and harvesting practices are presented. Reduction of transit temperatures to 50° should greatly retard decay, and maintenance at 45° should completely arrest development and spread during transit.

**The practicability of detecting Dutch elm disease by trunk sampling,** W. E. Ahrens. (U. S. D. A.). (*Phytopathology, 30* (*1940*), *No. 6, pp. 521–527, fig. 1*).—Tools and methods were developed for removing samples 0.5 in. in diameter, suitable for culturing, from trunks of suspected elms. During the dormant season (1936–37) this sampling was applied to 6,031 elms considered disease-free when inspected for foliar symptoms the preceding summer. The 45 new infections discovered constituted 28.3 percent of all infections found in the plats by scouting for foliar symptoms and by trunk sampling. Dormant-season trunk sampling was less expensive than intensive summer scouting. Several studies of trunk sampling during the growing season indicated that ±80–92 percent of infected elms showing foliar symptoms could be found by trunk sampling ±2 weeks after symptoms were observed. Those with vascular discoloration insufficient for detection were usually not severely affected. Trunk sampling during the dormant season at 6-in. intervals did not appear to injure the trees. Five ways in which trunk sampling might be used in control of Dutch elm diseases are enumerated.

**Some resupinate polypores from the region of the Great Lakes, X,** D. V. Baxter (*Mich. Acad. Sci., Arts, and Letters, Papers, 24* (*1938*), *pt. 1, pp. 167–188, pls. 7*).—There is said to be great variation among northern wood-inhabiting fungi in their ability to grow on different tree species. Although some of them exist naturally under widely different forest conditions, certain of them are found only on conifers, whereas others occur only on hardwoods. The synopsis of the resupinate polypores included in this paper of the series is based chiefly on collections in the various forest regions of the Great Lakes and elsewhere in the continental United States, Alaska, the Yukon Territory, and the Mackenzie District of the Northwest Territories. Nine species of *Poria* and four of *Polyporus* are described, including some new taxonomy.

**Polyporus ellisianus (Murr.) Sacc. and Trott and Polyporus anceps Pk. in culture: A study of isolates from widely separated forest regions,** D. V. Baxter and W. E. Manis (*Mich. Acad. Sci., Arts, and Letters, Papers, 24* (*1938*), *pt. 1, pp. 189–195, pls. 3, figs. 2*).—The western red rot, which has been attributed to *P. ellisianus*, is said to be one of the most common rots of *Pinus ponderosa*. *P. anceps* is also widely distributed throughout the West (and East) on various

coniferous woods, but generally no serious losses in standing timber have been attributed to it in the East. The numerous variations in cultures of eight isolates of these two fungi point to the fact that different races or strains exist, even though the fungi may have come from the same region. These differences were as great as any morphological distinctions that could be determined from the fragmentary type material of *P. ellisianus* and the known *P. anceps* material. For the present and until the authors have had opportunity to restudy the type material further, it is believed that the known morphological distinctions (largely in growth habit) are not great enough to separate the two as distinct species.

**A pink stain of wood caused by a species of Geotrichum,** M. S. CHIDESTER. (U. S. D. A.). (*Phytopathology, 30 (1940), No. 6, pp. 530–533, pl. 1*).—*Geotrichum* sp. was isolated from pink-stained sapwood and heartwood of southern yellow pine lumber. Experimentally it produced the same color in heartwood and sapwood of silver fir (*Abies amabilis*), yellow birch (*Betula lutea*), black spruce (*Picea mariana*), loblolly pine (*Pinus taeda*), Douglas fir (*Pseudotsuga taxifolia*), red oak (*Quercus borealis* [=*Q. rubra ambigua*]), southern cypress (*Taxodium distichum*), and western hemlock (*Tsuga heterophylla*).

**Spread of canker in California threatens existence of Monterey cypress and columnar Italian cypress,** L. R. TEHON (*Amer. Nurseryman, 71 (1940), No. 7, p. 28*).—Note on the *Coryneum cardinale* canker of *Cupressus macrocarpa* and *C. sempervirens stricta* now prevalent in California and New Zealand.

**Chlorotic cypress,** L. R. TEHON (*Amer. Nurseryman, 71 (1940), No. 7, p. 29*).—Note on successful control of chlorosis of baldcypress by trunk injection of 5 percent ferric chloride.

**Studies on the biology of Valsa sordida and Cytospora chrysosperma,** C. M. CHRISTENSEN. (Minn. Expt. Sta.). (*Phytopathology, 30 (1940), No. 6, pp. 459–475, figs. 3*).—The structure of pycnidia formed on sterile bark and on agar, size of conidia, rate of growth of agar, and general cultural characters were compared for numerous isolates of *C. chrysosperma* from *Populus* and other hardwood genera, and for *V. sordida* from *P. tremuloides*. No consistent differences were noted among isolates from different hosts or among isolates of *C. chrysosperma* from the various hosts and *V. sordida* from *P. tremuloides*, nor was any legitimate basis found for separating *C. chrysosperma* from other so-called species of *Cytospora*. *C. chrysosperma* was found commonly inhabiting the bark of apparently healthy trees of several species of poplar and willow as well as mountain ash and some other trees. On these hosts it fruited only when the trees were dying or dead. The author therefore considers its parasitism on these trees open to question. It is suggested that control of *Cytospora* canker on ornamental poplars should be approached by attempting to develop varieties more suited to their general environment than the ones at present used.

**Two serious diseases of shade trees,** B. O. DODGE (*Jour. N. Y. Bot. Gard., 41 (1940), No. 484, pp. 93, 94*).—Brief notes on the London plane tree blight due to *Ceratostomella* sp. and the bleeding canker of maples due to *Phytophthora cactorum*.

**New stages of Sporocybe azaleae,** W. H. DAVIS. (Mass. State Col.). (*Phytopathology, 30 (1940), No. 6, pp. 506–514, figs. 2*).—A general study of the twig and bud blight of azaleas and rhododendrons due to *S. azaleae* has been noted (E. S. R., 81, p. 388). The fungus has been imperfectly known but is usually recognized by coremia on the infected host parts. Experimental evidence is here presented to indicate that *S. azaleae* possesses mycelial, chlamydosporic, cephalosporic, penicilloid, coremial, and probably also ascogenous stages.

Scientific descriptions of these stages, together with drawings and photomicrographs are given.

**Monilinia causing a brown rot and blight of the common azalea,** E. E. Honey. (Univ. Wis.). (*Phytopathology, 30 (1940), No. 6, pp. 537, 538*).—*M. azaleae* n. sp. pathogenic on leaves, shoots, and fruits of *Rhododendron roseum* (=*R. maximum roseum*) collected near Ithaca, N. Y., is described. It is believed that a monilioid conidial stage collected on the leaves of *R. canescens* (= *Azalea canescens*) at Winterville, near Athens, Ga., belongs to the same species.

**Diseases of bulbs,** W. C. Moore ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul. 117 (1939), pp. VI+176, pls. 20*).—This handbook (709 references) considers diseases of Liliaceae (hyacinth, tulip, lily, etc.), Amaryllidaceae (narcissus and snowdrop), and Iridaceae (gladiolus, iris, crocus, etc.).

**Fusarium leaf spot of Sansevieria,** L. K. Jones. (Wash. Expt. Sta.). (*Phytopathology, 30 (1940), No. 6, pp. 527–530, figs. 2*).—A leaf spot of *S. zeylandica* and its variety *laurentii*, shown to be due to *F. moniliforme*, is reported common in many of the greenhouses of Washington State. Inoculations with a number of other fungi and bacteria indicated that *Botrytis allii* and *Penicillium gladioli* can also induce lesions on the leaves.

## ECONOMIC ZOOLOGY—ENTOMOLOGY

**Hawks in the hand,** F. and J. Craighead (*Boston: Houghton Mifflin Co., 1939, pp. XIII+290, pls. 57; rev. in Jour. Forestry, 38 (1940), No. 3, pp. 291, 292*).—Observations of the life and habits of many wild fowls, particularly predaceous fowl, including eagles (bald and golden), hawks (duck, red-shouldered, broad-winged, red-tailed, Cooper's, sparrow, pigeon, marsh, and goshawk), owls (barn, great horned, long-eared, barred, short-eared, burrowing, and screech), osprey, northern raven, prairie falcons, and others, based upon studies in nature, are presented. Methods of study, including the photographic technic employed, are included. The review is by J. S. W[ade].

**Adaptive coloration in animals,** H. B. Cott (*London: Methuen & Co., [1940], pp. XXXII+508, pls. [49], figs. 84*).—The three parts of this work deal with concealment (pp. 1–186), advertisement (pp. 187–307), and disguise (pp. 309–424). A bibliography of 685 titles is included.

**Life and habits of field mice,** W. J. Hamilton, Jr. (Cornell Univ.). (*Sci. Mo., 50 (1940), No. 5, pp. 425–434, figs. 8*).

**Observations on the life history of the red squirrel in New York,** W. J. Hamilton, Jr. (*Amer. Midland Nat., 22 (1939), No. 3, pp. 732–745, figs. 2*).

**Life history notes on the Piute ground squirrel,** J. R. Alcorn. (Univ. Calif.). (*Jour. Mammal., 21 (1940), No. 2, pp. 160–170, fig. 1*).—These notes relate to the life history and habits of *Citellus townsendii mollis* under observation near Fallon, Nev.

***Food of central Wisconsin horned owls,*** *F.* Hamerstrom *and O.* Mattson. (Univ. Wis.). (*Amer. Midland Nat., 22 (1939), No. 3, pp. 700–702*).—The results of analyses of 678 horned owl (*Bubo virginianus*) pellets picked up in central Wisconsin and data on some prey species of particular interest are given in detail in two tables. "Pinnated, sharp-tailed, and ruffed grouse populations were low in the first winter and of these sharptails seemed to be most noticeably starting the upswing of the cycle in 1936–37, at which time Hamerstrom [E. S. R., 81, p. 804] estimated the combined pinnate and sharptail population at 1 bird to 85–100 acres, with a ratio of 3 sharptails to 1 pinnate. No grouse remains were found in any pellets of the first winter but several occurred in the 1936–37 pellets. Meadow mice were markedly less abundant in the second winter than in the first; this was very evident from the number of runways exposed after

the snow melted. A total of 466 trap nights in the autumn of 1936 and the early spring of 1937 caught only 2 meadow mice and 18 deer mice. However, there were more mice in the pellets of the second winter. Cottontails were scarce the first winter, but appeared to be even scarcer during the second. Unfortunately we made no cottontail field counts the first year, but in the autumn of the second only 20 were seen in 100 hr. in the field."

**The birds of Buckeye Lake, Ohio,** M. B. TRAUTMAN (*Mich. Univ., Mus. Zool. Misc. Pub. 44 (1940), pp. 466, pls. 16, figs. 2*).—In this work the author has attempted to present a complete conception of the status of bird species in the Buckeye Lake area. A systematic account is given of the 282 species and 6 additional subspecies recorded from this area, with data on their arrival and departure, and life history and habits, together with a 6-page list of references cited and an index of common and scientific names.

**Lead shot: Its danger to water-fowl,** T. L. G. OSMER. (Minn. Expt. Sta.). (*Sci. Mo., 50 (1940), No. 5, pp. 455–459*).

**Curtailment of egg production in the common ring-necked pheasant due to experimental infection with the oviduct fluke Prosthogonimus macrorchis,** R. W. MACY (*Jour. Parasitol., 26 (1940), No. 2, p. 158*).

**Nesting habits and causes of nest mortality of the ringneck pheasant,** P. E. RANDALL. (Pa. State Col.). (*Game Breeder & Sportsman, 45 (1940), No. 4, pp. 53, 54, 59–61, figs. 2*).

**Feeding habits of the Franklin's gull in North Dakota,** S. SAUGSTAD (*North Dakota Sta. Bimo. Bul., 2 (1940), No. 5, pp. 14–16, figs. 2*).—Studies of the feeding habits of *Larus pipixcan*, one of the more popular birds of the State, are reported. Its habits are said to be commonly accepted as particularly beneficial to agriculture, since it feeds largely upon obnoxious insects. Gulls collected near Moffit largely in mid-July of the preceding 2 yr. had consumed an average of about 27 adult grasshoppers. *Melanoplus mexicanus* (stubble or migratory grasshopper), the two-striped grasshopper, and the differential grasshopper were commonly represented in the crop contents. Although grasshoppers were the most readily available insects in that area, they were not sufficiently numerous locally to seriously threaten the crops. It is concluded that the feeding habits of these gulls would not be an important check against grasshopper damage over an extensive area during periods of severe infestations when populations range up to 30 or more per square yard. In years when the grasshopper population is moderate or light, this foraging would act as a check over limited areas adjacent to large colonies of gulls. Of the 8 gulls examined, 5 were found to have consumed some 21 Say's plant bugs, indicating that they act as a check on this pest of cereal and forage crops. The bulk of the crop and gizzard contents of the gulls collected in late September and early October was found to consist of predaceous ground beetles (Carabidae). The limited investigation is considered to indicate that on the whole this gull is distinctly beneficial to agriculture in the State.

**Proceedings Eighteenth Annual Meeting of the North Central States Entomologists** (*North Cent. States Ent. Proc., 18 (1939), pp. 6–22, 24–40, 50–60, 62–65, 68–88*).—Among the contributions presented at the annual meeting (E. S. R., 81, p. 806) held in St. Paul, Minn., in March 1939 and included in this mimeographed report are: Some Ecological Aspects Concerning the Forest Tent Caterpillar on the National Forests in Minnesota—The Recent Forest Tent Caterpillar Outbreak on the Chippewa and Superior National Forests (Minnesota), by R. H. Nagel (pp. 6–10); Forest Tent Caterpillar, by A. C. Hodson (p. 10); New Facts on the Biology of Grasshopper Parasites and Natural Enemies, by R. H. Painter (p. 10); The Oriental Fruit Moth Situation—Progress in Oriental Fruit Moth Control, by R. Hutson (p. 11); The Oriental

Fruit Moth Situation, by S. C. Chandler (pp. 11, 12); Recent Contributions to the Study of Insect Transmission of Plant Diseases, by A. A. Granovsky (pp. 13–15); Recent Advances in Pea Insect Control, by E. M. Searls (pp. 15, 16); Pea Aphis Control, by H. F. Wilson and C. E. Dieter (pp. 16–21); Grasshopper Control Research—U. S. D. A. Grasshopper Research Program, by J. R. Parker (pp. 24–26); Grasshopper Bait Moisture Experiments, by J. Medler (pp. 26, 27); Grasshopper Research in Wisconsin in 1938, by J. H. Lilly (pp. 27–30); Review of Research Program on Range Grasshoppers, by F. A. Morton (pp. 30–35); Method of Conducting Field Tests of Grasshopper Baits, by E. J. Hinman (pp. 35, 36); Grasshopper Surveys, by R. L. Shotwell (pp. 36–38); Grasshopper Surveys in Manitoba With Reference to Their Development in the Prairie Provinces, by R. D. Bird (pp. 38–40); The Present Status of the White Grub [*Phyllophaga* sp.] Problem, by T. R. Chamberlin (pp. 50, 51); White Grubs and Maintenance of Lawns and Pastures, by W. P. Flint (p. 52); The Identification of White Grubs, by W. P. Hayes (pp. 52, 53); White Grubs and Soil Conservation, by D. B. Whelan (pp. 53, 54); Effect of Drought on White Grub Populations, by A. A. Granovsky (pp. 55, 56); Spraying of Trees and Laboratory Tests With Insecticides to Control the Adult June Beetles, by C. L. Fluke (p. 57); Recent Progress in the Study of Mothproofing, by C. L. Metcalf (p. 59); Insects and the Ever-Normal Granary, by R. T. Cotton, W. P. Flint, and P. N. Annand (pp. 62, 63); New Developments in the Control of Termites, by W. E. McCauley (pp. 63, 64); Recent Work With Methyl Bromide as a Fumigant, by H. H. Shepard (p. 65); Estimating the Value of Bees as Pollinators—Relationship of Bees to Agriculture, by F. B. Paddock (pp. 68, 69); Possibilities of Pollen Substitutes, by M. H. Haydak and R. L. Parker (pp. 69–71); The European Spruce Sawfly Problem, by H. J. MacAloney (p. 72); The Insect Problem in Shelterbelt Plantations, by J. A. Munro (pp. 73, 74); The Poplar Borer (*Saperda calcarata* Say) in the Parkland Regions of the Prairie Provinces of Canada, by L. O. Peterson (pp. 76–78); The Control of Bark Beetles and Borers by Means of Chemicals, by S. C. Chandler (p. 79); The Insect Problem in Forest Nurseries, by R. H. Nagel (p. 80); The Problem of Resistance to Defoliation by Deciduous and Coniferous Trees, by A. C. Hodson (pp. 81, 82); The Use of Oil Sprays on Coniferous Trees for the Control of Scale Insects, by R. Hutson (pp. 82, 83); The Equine Encephalomyelitis Problem—Clinical Manifestations of Equine Encephalomyelitis, by W. L. Boyd, W. A. Riley, and G. D. Jones (pp. 84, 85); Observations on Screwworm Outbreaks in the Territory Beyond Winter Survival, by W. E. McCauley (p. 86); Bot Control Campaigns—Horse Bot Control, by F. G. Butcher (p. 87); and Mosquito Problem in a Metropolitan Area, by W. A. Riley (pp. 87, 88).

**Some blood parasites from Montana birds,** G. R. Coatney and W. L. Jellison (*Jour. Parasitol., 26 (1940), No. 2, pp. 158–160*).

**The eggs of Japanese birds, XII–XV,** K. Kobayashi and T. Ishizawa (*Rokko, Kobe, Japan: Keisuke Kobayashi, 1938, pts. 12–13, pp. [1]+145–175, pls. 11; 14, pp. [1]+177–201, pls. 7; 15, pp. [1]+203–232, pls. 6*).—A continuation of the work previously noted (E. S. R., 74, p. 810).

**The rattlesnakes, genera Sistrurus and Crotalus: A study in zoogeography and evolution,** H. K. Gloyd (*Chicago Acad. Sci., Spec. Pub. No. 4 (1940), pp. VII+266+[4], pls. 31, figs. [32]*).—This work includes references to their nomenclature; distribution, including locality records; variation, etc; and is presented with a 17-page list of references to the literature.

**The fauna of the soil,** A. P. Jacot (*Quart. Rev. Biol., 15 (1940), No. 1, pp. 28–58*).—This contribution is presented with a list of 104 references.

**Insect problems of the New York fruit grower,** H. Glasgow (*Pa. State Hort. Assoc. Proc., 81 (1940), pp. 69–74*).

**The different factors affecting the temperature of a heap of grain in the open,** R. Attia (*Egypt. Min. Agr., Tech. and Sci. Serv. Bul. 192 (1939), pp. [3]+50, pls. 43*).—A study relating to the effects upon insect infestation, the details being given in 18 tables and 43 graphs.

**Some ecological observations on the insect-fauna of dung,** M. Hafez (*Bul. Soc. Fouad 1. Ent., 23 (1939), pp. 241–287, figs. 8*).—Included in this account is a classified list of dung insects found, a discussion of the power of attraction of different kinds of dung to insects, the results of several oviposition experiments, etc., and a four-page list of references.

**[Contributions on economic insects]** (*Ill. State Acad. Sci. Trans., 32 (1939), No. 2, pp. 46, 204, 205, 227, 228*).—Contributions presented at the annual meeting held in Springfield in May 1939 include: Insect Abundance Around Wild Life Area, by M. D. Farrar and W. P. Flint (p. 46); The Relation of Body Size and Egg Size in *Drosophila*, by H. J. Eigenbrodt and P. A. Zahl (pp. 204, 205); and The Silverfish in a New Role, by R. E. Slabaugh (pp. 227, 228), and Notes on the Predaceous Stink Bug *Apateticus cynicus* Say, by P. C. Stone (p. 228) (both Univ. Ill.).

**[Contributions on injurious and beneficial insects and rodent pests of fruit]** (*Mass. Fruit Growers' Assoc. Rpts., 44 (1938), pp. 26–32, 213–223; 45 (1939), pp. 34–36, 70–74, 156–170; 46 (1940), pp. 15, 16, 18–21*).—Contributions presented at the forty-fourth meeting include: The Mouse Control Project, by W. W. Dykstra (p. 26); Insect Pests in Massachusetts Orchards in 1937, by A. I. Bourne, W. D. Whitcomb, and W. H. Thies (pp. 213–217), and Report of Committee on Disease and Insect Pests, by A. I. Bourne (pp. 218–220) (both Mass. State Col.); and Progress Report on Rodent Control, by W. W. Dykstra (pp. 221–223).

Those presented at the forty-fifth meeting include: Report on Peach Parasite Project, by A. I. Bourne (pp. 34–36); Effectiveness of Parasites for Controlling the Oriental Fruit Moth, by P. Garman (pp. 70–74); New Insect Problems of Massachusetts Fruit Growers—What Are They? by W. D. Whitcomb (pp. 156–163) (Mass. State Col.); and Spraying for Red-Banded Leaf Roller and Eye-Spotted Budmoth, by S. W. Harman (pp. 165–170) (N. Y. State Expt. Sta.).

Those presented at the forty-sixth meeting include: Oriental Fruit Moth Parasite Project, 1939, by A. I. Bourne (pp. 15, 16); and Orchard Insect Pests in 1939, by W. D. Whitcomb and A. I. Bourne (pp. 18–21).

**Report on insect investigations for the 1939 season,** A. W. Morrill, Jr., and D. S. Lacroix. (Coop. U. S. D. A.). (*Connecticut [New Haven] Sta. Bul. 433 (1940), pp. 186–193, figs. 3*).—A progress report of work carried on since 1936 (E. S. R., 81, p. 540) in which reference is made to that with the potato flea beetle, the tobacco thrips, and wireworms (chiefly the eastern field wireworm), and to the abundance of insects during the year. A brief report on thrips and flea beetle control experiments, by Lacroix, is included (pp. 191–193).

**[Work in economic entomology and parasitology by the Hawaii Station]** (*Hawaii Sta. Rpt. 1939, pp. 36–42, 64–68, 79, figs. 1*).—Reporting for the year (E. S. R., 81, p. 671) the work referred to includes the ecology of the tomato bug *Cyrtopeltis varians* and possible vectors of a virus disease of papaya, both by F. G. Holdaway and [W. C.] Look; biological control of the imported cabbageworm, by Holdaway and A. Suehiro; miscellaneous insect pests of crops in Hawaii (five of which are of recent occurrence, namely, the striped datura beetle *Lema nigrovittata*, vegetable weevil, bean pod borer *Maruca testulalis*, harlequin bug, and the fire ant), by Holdaway, Suehiro, and Look; treatment of fluky cattle with Distol and with kamala, poultry parasites, including relation of nutrition to tapeworm infection and the life cycle of the

cecal fluke *Postharmostomum gallinum* and the pinworm *Subulura brumpti*, and parasites of horses in Hawaii, all by J. E. Alicata; and vaccination of day-old chicks for control of fowl pox and control of coccidiosis in wire-floored batteries and houses, both by C. M. Bice.

[**Work in economic entomology by the Kentucky Station**]. (Partly coop. U. S. D. A.). (*Kentucky Sta. Rpt. 1939, pt. 1, pp. 24, 25, 28–31, 32, 38, 39*).—The work of the year reported upon (E. S. R., 81, p. 540) includes tests on the effectiveness of nicotine in controlling poultry lice, control of the green June beetle larvae in plant beds, resistance of adapted and nonadapted red clover to pea aphid injury, the codling moth and its control, rosy apple aphid and the apple grain aphid, field tests with oil nicotine spray, oriental fruit moth parasites, the strawberry crown borer, distribution of white grubs (*Phyllophaga* sp.), control of May beetles, life cycle of *P. ephilida*, the Japanese and the white-fringed beetles, and control of injury to tobacco plants by wireworms (*Aeolus dorsalis* (Say) and *Conoderes auritus* (Herbst)).

[**Contributions on orchard pests**] (*N. Y. State Hort. Soc. Proc., 84 (1939), pp. 13–26, 179–183; 85 (1940), pp. 12–38, 58–63, 281–306, figs. 2*).—Contributions relating to orchard pests presented at the eighty-fourth meeting are Fruit Insect Problems in 1938, by J. A. Evans (pp. 13–23) (Cornell Univ.); and Mouse Control, by W. B. Robinson (pp. 179–182) (U. S. D. A.).

Contributions presented at the eighty-fifth meeting include Insect Pest Problems of Importance to the Fruit Industry in 1939, by P. J. Chapman (pp. 12–29) (N. Y. State Expt. Sta.); Rodent Control in the Orchard and in the Cold Storage, by W. B. Robinson (pp. 31–38) (U. S. D. A.); Essentials and Non-essentials in a Non-wash Spray Program, by M. E. Buckman (pp. 58–60); Fundamentals of Codling Moth Control With Special Reference to Nicotine, by W. S. Hough (pp. 281–286) (Va. Sta.); Codling Moth Control From the Western New York Point of View, by S. W. Harman (pp. 286–295), and Codling Moth Problems in the Hudson Valley, by P. J. Chapman (pp. 295–302) (both N. Y. State Sta.); and Extension Aspects of the Codling Moth Problem, by J. A. Evans (pp. 303–306) (Cornell Univ.).

**Present status of some Ohio peach pests**, R. B. Neiswander. (Ohio Expt. Sta.). (*Ohio State Hort. Soc. Proc., 73 (1940), pp. 32–40*).

[**Work in economic entomology by the Ohio Station**] (*Ohio Sta. Bul. 600 (1939), pp. 18, 26–34, figs. 6*).—The work of the year (E. S. R., 79, p. 650) reported upon includes a study of damage to inbred lines of corn by the larvae of the southern corn rootworm; control of the oriental fruit moth by larval parasites, particularly *Macrocentrus ancylivorus* Roh.; experiments for the control of the roundheaded apple tree borer and the potato leafhopper; tests with insecticides for control of the imported cabbageworm, the cabbage looper, and the diamondback moth; insect control on plants by means of poison supplied through the roots; a study of the response to lights of the tomato fruitworm (officially known as the corn earworm), the armyworm, and the tomato worm; and experiments with a modified two-queen system for honey production.

[**Work in economic entomology by the South Carolina Station**]. (Partly coop. U. S. D. A.). (*South Carolina Sta. Rpt. 1939, pp. 77–80, 124–134, 142–146, 177–180, 189–194, figs. 7*).—Work at the station and substations briefly reported upon (E. S. R., 81, p. 68) relates to the cowpea curculio, by F. Sherman and O. L. Cartwright; the oriental fruit moth, by Cartwright; poison tests with the tomato fruitworm, by Sherman; bollweevil and miscellaneous cotton insect investigations, including tests of presquare treatments for bollweevil control, small plat experiments for bollweevil and leaf aphids, toxicity of calcium arsenate to predaceous Coccinellidae, effect of cryolite on soils and plant growth,

and experiments on control of cotton root aphids, by F. F. Bondy and C. F. Rainwater; control of the tobacco flea beetle in tobacco plant beds, by N. Allen, L. A. Schifino, and J. M. Webb; cabbage insect investigations, by W. J. Reid, Jr., and C. O. Bare; and insect control investigations, particularly with the pickleworm and the asparagus beetle, by J. G. Watts.

**Entomology**, S. Marcovitch (*Tennessee Sta. Rpt. 1938, pp. 62, 63*).—The work of the year reported upon (E. S. R., 80, p. 223) relates to the plum curculio, magnesium oxide as a corrective for cryolite injury of fruit, control of the tobacco hornworm, and the more important insects (armyworm, corn earworm, and Mexican bean beetle) of the year.

**[Work in apiculture by the Wyoming Station]** (*Wyoming Sta. Rpt. 1939, pp. 17–19*).—The work of the year, which again relates to breeding for resistance to American foulbrood (coop. U. S. D. A. and other experiment stations), outside wintering of bees, and two-queen colonies, is briefly considered in this report (E. S. R., 81, p. 553).

**Field crop insects and their control**, A. V. Mitchener (*Manitoba Dept. Agr. and Immigr. Cir., 140 (1940)*, folder).—A practical account of field crop insects and their control is presented as a chart, and a key is given to assist in the identification of the injurious stages of insects commonly destructive to field crops in Manitoba.

**Cotton pests in the Philippines**, F. Q. Otanes and F. L. Butao (*Philippine Jour. Agr., 10 (1939), No. 4, pp. 341–371, pls. 13*).—This is a summary (with 25 references) of the more important insect pests of cotton in the Philippines.

**Insects of the pecan**, G. F. Moznette, C. B. Nickels, W. C. Pierce, and T. L. Bissell (*U. S. Dept. Agr., Farmers' Bul. 1829 (1940), pp. 1–36, 37, figs. 43*).—A practical illustrated summary of information on the important insect enemies of the pecan, which supersedes Farmers' Bulletin 1654 (E. S. R., 64, p. 749).

**Insect pests of azaleas and camellias and their control**, L. L. English and G. F. Turnipseed (*Alabama Sta. Cir. 84 (1940), pp. 18, figs. 13*).—A practical account of the insects (azalea lacebug *Stephanitis pyrioides* Scott, azalea mealybug *Eriococcus azaleae* Comst., the greenhouse thrips, peony scale *Pseudaonidia paeoniae* Ckll., azalea whitefly *Aleyrodes azaleae* B. & M., azalea leaf miner *Gracilaria azaleella* Brants, red mite *Paratetranychus ilicis* McG., yellow mite (*Tetranychus* sp.), and *Colaspis favosa* Say) in Alabama that attack azaleas and of those (tea scale *Fiorinia theae* Green, camellia scale *Lepidosaphes camelliae* Hoke, the chaff scale, Florida red scale, soft scale, peony scale *Pseudaonidia paeoniae* Ckll, and the cotton aphid) that attack camellias. Information on sprayers, spraying, spray schedules and dilutions, and proportions for mixing sprays is included.

**Control of stored grain pests in Nebraska**, M. H. Swenk and D. B. Whelan (*Nebraska Sta. Cir. 62 (1940), pp. 11, figs. 9*).—A practical account of control measures for the stored grain pests of the State.

**Study of some forest insects of Nanking and its vicinity.—III, Observations on the gypsy moth (Porthetria dispar L.)**, C. P. Miao (*Sci. Soc. China, Biol. Lab. Contrib., Zool. Ser., 13 (1939), No. 5, pp. 57–77, figs. 14; Chin. abs., p. 77*).—This further report of studies (E. S. R., 82, p. 219) relates to observations of the gypsy moth in Nanking.

**Entomological conditions in 1939**, J. R. Watson. (Fla. Expt. Sta.). (*Citrus Indus., 21 (1940), No. 2, pp. 11, 14*).

**Field sampling for the comparison of infestations of strawberry crops by the aphis Capitophorus fragariae Theob.**, R. M. Greenslade and S. C. Pearce (*Jour. Pomol. and Hort. Sci., 17 (1940), No. 4, pp. 308–317*).

**Dusting peanuts to control pests**, L. I. Miller. (Va. Expt. Sta.). (*South. Planter, 101 (1940), No. 5, pp. 20, 21, figs. 2*).—This practical contribution is based

upon experimental work conducted during 1938 and 1939, and that reported in Bulletin 316 (E. S. R., 79, p. 508).

**Toxicity studies on 2-4-dinitro-6-cyclohexyl-phenol, a new insecticide,** A. K. Hrenoff and C. D. Leake. (Univ. Calif.). (*Calif. Univ. Pubs. Pharmacol., 1 (1939), No. 12, pp. [2]+151-159*).—Studies aimed at the determination of the public health hazard of this new insecticide, experiments with which by Kagy and Richardson (E. S. R., 75, p. 225) have shown that a 1-percent petroleum oil solution of the chemical is powerful enough to kill San Jose scale and eggs of various orchard pests without damage to trees or fruit, are reported. The feeding experiments quite clearly indicate that there is no danger to consumers from fruits from trees dusted with preparations containing 1 percent of the chemical. This is given with 18 references to the literature.

**The case for deodorized insecticide oils,** A. B. Weingard (*Soap and Sanit. Chem., 15 (1939), No. 9, pp. 109, 113*).

**Derris dust for control of cucumber insects,** C. Lyle (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 4, p. 8*).—A derris dust containing 0.5–0.75 percent rotenone is the best means of control thus far found by the station for striped cucumber beetles, which attack the plants as they come through the ground and serve as overwintering hosts for bacterial wilt of cucurbits. It was found in tests that copper oxychloride added to derris is helpful in checking the disease. Where derris is not available, a mixture of 1 part calcium arsenate and 9 parts talc, gypsum, or hydrated lime applied once or twice a week when the beetles are most numerous will be very helpful. During the past season a mixture of 1 part basic copper arsenate and 19 parts talc was as effective as a 10 percent calcium arsenate dust. Some experiments in 1939 indicate that derris dust reduces pickleworm infestation of cucumbers, but it has not been definitely determined that its control is sufficient to justify the expense.

**Toxicity of Tephrosia,** A. F. Sievers and W. N. Sullivan. (U. S. D. A.). (*Soap and Sanit. Chem., 15 (1939), No. 9, pp. 111, 113*).—The results of toxicity tests on flies of extracts of the roots of *T. virginiana* prepared by several methods, in which the extracts were tested at such a concentration that 1 cc. contained the extractive from 4 mg. of root, are reported in table form.

**Tests on crawling insects: Tentative methods for evaluating liquid household insecticides against the German cockroach and the bedbug,** E. N. Woodbury and C. S. Barnhart. (Ohio State Univ. et al.). (*Soap and Sanit. Chem., 15 (1939), No. 9, pp. 93, 95, 97, 99, 101, 103, 105, 107, 113, figs. 9*).

**Chemical effect on lead arsenate of certain salts which may be present in soil and spray waters,** J. M. Ginsburg. (N. J. Expt. Stas.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 3, pp. 199-205*).—The increased application during recent years of lead arsenate to the soil in large quantities for destroying Japanese beetle larvae and other grubs and the possibility of accumulating large amounts of arsenic in certain soils led to these studies. The results of analyses to determine the soluble arsenic formed from this insecticide (2 gm. in 500 cc.) when mixed with different salts in approximate stoichiometrical proportions are tabulated. Some 50 salts generally present either in soils or spray waters were tested in the laboratory to determine to what extent they form soluble arsenic when in contact with acid lead arsenate. The salts were mixed in various concentrations with constant quantities of lead arsenate (about 3 lb. per 100 gal.) and allowed to stand 24 hr. with frequent shaking. The filtrates were analyzed for soluble arsenic. Of the 10 groups of salts tested, the nitrates, sulfates, and acetates, without exception, proved relatively nonreactive with $PbHAsO_4$. The chlorides, silicates, and bicarbonates produced

moderate quantities of soluble arsenic. Salts of carbonates and sulfides usually formed large percentages of soluble arsenic. In the phosphate group, the 3 phosphates of calcium and the monobasic phosphates of sodium and potassium formed inappreciable quantities of soluble arsenic, whereas the dibasic and especially the tribasic phosphates of either sodium or potassium formed large amounts. The percentage of solubility of a salt in water is, by itself, not a determining factor in forming soluble arsenic. But, of a group of salts capable of decomposing lead arsenate, the salt which is highly soluble in water will form more soluble arsenic than one only slightly soluble in water. The H-ion concentration of the salt solution plays, with few exceptions, an important role in decomposing lead arsenate. Salts with pH values of 8.0–11.4 produced, with two exceptions, more soluble arsenic than did salts with lower pH values. A list of 18 references is included.

**Insecticidal properties of extract of male fern (Aspidium filix-mas [L.] Sw.)**, FRANK WILCOXON, A. HARTZELL, and FREDERICKA WILCOXON (*Contrib. Boyce Thompson Inst., 11 (1939), No. 1, pt. 1, pp. 1–4, fig. 1*).—In a test of the insecticidal properties of oleoresin of male fern on mosquito larvae (southern house mosquito), bean aphid, and housefly, it was found to be four times as toxic as crude filicin. Satisfactory control of bean aphid was obtained with a spray containing 0.03 percent of crude filicin and 0.5 percent Penetrol. "When tested by the Peet-Grady method on houseflies a grade 'B' insecticide was obtained with a spray containing 0.05 percent pyrethrins and 0.2 percent crude filicin in 'Deobase' as a solvent. No injury was observed when 10 species of common plants were sprayed with a solution containing 0.05 percent crude filicin and 0.5 percent Penetrol." A list is given of 14 references to the literature.

**Preliminary studies on the comparative value of some sprays and dusts in potato insect control**, H. C. MANIS and I. LEFFERT. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 14 (1940), No. 2, pp. 155–161, figs. 3*).—In spraying and dusting experiments conducted during the summer of 1938 on station plats in which leafhoppers alone were sufficiently abundant throughout the season to affect the results obtained, "sulfur dust (325 mesh) and 4–4–50 bordeaux mixture were effective in reducing the leafhopper population and the amount of damage due to 'hopperburn.' The use of these two insecticides resulted in a significantly increased yield over all the other plats with the exception of the yield obtained on derris-treated plats. Sulfur dust containing paris green was as effective as sulfur dust and 4–4–50 bordeaux mixture in reducing leafhopper populations and the amount of damage, but the yield was lowered significantly possibly because of some harmful action of paris green on the plant. Counts on plats treated with paris green applied as a dust, with talc as the inert carrier, show a pronounced reduction in leafhopper populations comparable to that obtained with sulfur-paris green dust. The amount of damage was higher than on any of the other plats partially because of burning caused by the insecticide. The yield on these plats was significantly lower than any of the others. Counts on plats sprayed with paris green-hydrated lime show little, if any, reduction in leafhopper populations. Damage is high, and there is a considerable reduction in yield. The derris-talc dust is not consistent in its reduction of leafhopper populations. Damage was relatively high, but the yield also was high. Plats treated with a high calcium hydrated lime spray gave somewhat similar results to those obtained on derris-treated plats with a slightly, but not significantly, lower mean yield."

**Insect olfactory responses: Construction and use of an olfactometer for muscoid flies, and a discussion of interpreting results**, C. EAGLESON.

(U. S. D. A.). (*Soap and Sanit. Chem., 15 (1939), No. 12, pp. 123, 125, 127, fig. 1*).—An olfactometer, in which muscoid flies are imprisoned in a U of adjustable length, one arm of which is perfused with the odor of the attractive or repellent material tested, is described and figured. It has given consistent results in testing the reactions of the housefly, the stablefly, and the screw-worm to certain chemicals. At regular intervals counts are made of the number of insects resting on the wire-screen septa closing the arms of the U.

**Some temperature coefficients for insect oviposition, F. H. Harries.** (U. S. D. A.). (*Ann. Ent. Soc. Amer., 32 (1939), No. 4, pp. 758–776, figs. 4*).—Studies of the effect of temperature on oviposition and reproduction of different insects show that the rate of activity is not proportional to the temperature through any appreciable temperature range as would be described by a straight-line graph. "Data on different species define S-shaped curves similar to those found for many other types of physiological activity. The general nature of the accelerative influence of temperature is illustrated by curve segments of increasing slope in which successive increases of the same difference in temperature apparently produce progressively greater increases in velocity. In comparison with definite types of curves commonly used to describe biological processes, data for the rising portions of the curves apparently favor the van't Hoff formula or analogous expressions in which the percentage increase in activity is proportional to the difference in temperature."

***Studies on Strongyloides agoutii* sp. nov. from the agouti (*Dasyprocta agouti*), H. J. Griffiths** (*Canad. Jour. Res., 18 (1940), No. 5, Sect. D, pp. 173–190, figs. 19*).—Report is made of a morphological and biological study of a hitherto unrecorded form of nematode genus *Strongyloides*, described as *S. agoutii* n. sp., from the golden-rumped agouti (*D. aguti*), a rodent native to Trinidad and northern South America. A brief résumé of the classical studies on species of the genus is included, together with a summary of existing hypotheses and theories on the biology of the group, as is a list of species and hosts for this genus.

**On the life cycle and other aspects of the snail, *Campeloma*, in the Speed River, J. C. Medcof** (*Canad. Jour. Res., 18 (1940), No. 5, Sect. D, pp. 165–172, figs. 2*).—Report is made of a study of the biology of what appears to be a new species of fresh water snail, closely allied to *C. decisum*, found living in the Speed River at Hespeler, Ont. A statistical study indicates that its life span is 5 yr. Parturition occurs in summer, and year classes are recognizable. Sizes of approximately 12, 17, and 23 mm. are reached in 1, 2, and 3 yr., respectively. Sexual maturity is reached in 2 yr., and reproduction is parthenogenetic. Some snails hibernate and some aestivate. Rest marks on shells and opercula and a limy deposit in the protoconch were studied.

**Studies in insect biology.—I, The brood provision and rearing instincts of beetles, H. von Lengerken** (*Ergebnisse der Insektenbiologie.—Band I, Die Brutfürsorge- und Brutpflege-Instinkte der Käfer. Leipzig: Akad. Verlagsgesell., 1939, pp. VIII+285, figs. 188*).—The first section of this volume (pp. 5–240) deals in part with provision, the second (pp. 240–274) with the rearing instinct, and the third (p. 274) with brood parasitism. The work is presented with a list of 97 references to the literature and a subject index.

**[Contributions on fruit insect control in Nova Scotia]** (*Nova Scotia Fruit Growers' Assoc. Ann. Rpt., 76 (1940), pp. 19–25, 27–29, 31, 32, 57–60*).—Contributions presented at the annual convention of the association held at Kentville in February 1940 include: The Insect Outlook for 1940, by J. McB. Cameron and A. D. Pickett (pp. 19–22); Emergency Spray Programs, by J. F. Hockey (pp. 22–25, 27); Remarks on the Control of Some of the More Important Apple

insects, by A. D. Pickett (pp. 27–29, 31, 32); and Nova Scotia Apple Maggot Control Board Report for Year Ending November 30, 1939, by V. B. Leonard (pp. 57–60).

**[Contributions on orchard insects and rodent pests and their control]** (*Ill. State Hort. Soc. Trans., 73 (1939), pp. 273–277, 351–364, 406–415, fig. 1*).—Contributions presented are: Rodent Control in Orchard and Vegetable Garden, by G. C. Oderkirk (pp. 273–277); The Apple Insect Outlook for 1940, by W. P. Flint and S. C. Chandler (pp. 351–360) (Ill. Expt. Sta. et al.); Use of Nicotine and Other Sprays in Test Plots, by F. Chatten (pp. 362–364); and Peach Insect Studies of 1939, by S. C. Chandler (pp. 406–414).

**A major cycle in insect flights,** J. M. Valentine (*Science, 91 (1940), No. 2371, p. 544*).

**The embryology and affinities of the Symphyla, based on a study of Hanseniella agilis,** O. W. Tiegs (*Quart. Jour. Micros. Sci. [London], n. ser., 82 (1940), No. 325, pp. 225, pls. 9, figs. 41*).

**Diphenylamine promising as soil poison against subterranean termites,** M. W. Smith. (Ohio State Univ.). (*Pests, 8 (1940), No. 2, pp. 19, 20*).

**Auditory perception in insects, with special reference to the cockroach,** P. Rau (*Quart. Rev. Biol., 15 (1940), No. 2, pp. 121–155*).—This contribution is presented with a list of 92 literature references.

**Sodium fluoride a proven method of roach control,** C. Lyle (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 5, p. 1*).—Reference is made to the value of sodium fluoride in the control of roaches and to pyrethrum products and derris as substitutes. It has been found that derris will retain its toxic properties to roaches for a long time when not exposed to sunlight. Pyrethrum is very toxic when first applied.

**The geographic distribution of Acrididae in northern Oklahoma,** J. H. Bragg (*Amer. Midland Nat., 22 (1939), No. 3, pp. 660–675, fig. 1*).

**Poison bran bait recommended for grasshopper control,** C. Lyle (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 5, p. 8*).

**Review field studies of citrus thrips control,** C. O. Persing, A. M. Boyce, and F. G. McCarty. (Calif. Citrus. Expt. Sta.). (*Citrus Leaves, 20 (1940), Nos. 3, pp. 1, 2, figs. 2; 4, pp. 5, 14, 20, 26, 30, figs. 2*).

**Studies in the biology and ecology of Retithrips syriacus Mayet, with special attention to its occurrence in Palestine (Thysanoptera),** E. Rivnay (*Bul. Soc. Fouad 1. Ent., 23 (1939), pp. 150–182, figs. 11*).—A report (with 28 references) of studies of *R. syriacus*, a polyphagous thrips enemy of several plants of economic importance, a heavy attack of which causes defoliation and as a rule hinders the normal development.

**Cultural practices seem to offer best control of lygus bugs in alfalfa seed fields,** C. J. Sorenson (*Farm and Home Sci. [Utah Sta.], 1 (1940), No. 2, pp. 6, 10, fig. 1*).—A practical account of the biology and control of true bugs of the genus *Lygus*, family Miridae, which attack the blossoms and seed of alfalfa, including *L. elisus* Van Duzee and *L. hesperus* Knight.

**Influence of the physiological age of the pea plant on its recovery from aphid damage,** C. D. Harrington and E. M. Searls. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 3, pp. 157–161, figs. 2*).—Report is made of the results of tests conducted during 1938 with 335 lots of peas comprising 275 field, garden, and canning varieties that were planted and infested with pea aphids with a view to eliminating susceptible varieties. The aphid population maintained damaging proportions for a 10-day period but was suddenly destroyed by disease. Following this decline of the aphids regeneration occurred in varying degrees among the varieties. The degree of recovery was found to be con-

trolled by the physiological age of the plants at the time of aphid damage and could not be attributed to aphid resistance. The authors were led to conclude that recovery data and yield records cannot safely be employed to determine comparative aphid resistance of pea varieties.

**Biolobical control of long-tail[ed] mealybug,** S. E. FLANDERS. (Calif. Citrus Expt. Sta.). (*Citrus Leaves, 20 (1940), No. 2, pp. 3, 4*).

**Toxicants and solids in oil used against the red scale,** W. EBELING. (Calif. Citrus Expt. Sta.). (*Citrus Leaves, 20 (1940), No. 2, pp. 1, 2, 11, figs. 3; also in Calif. Citrog., 25 (1940), No. 4, pp. 98, 130, figs. 2*).

**The louse,** P. A. BUXTON (*London: Edward Arnold & Co., [1939], pp. IX+115, figs. 28*).—The chapters of this work deal with the Anoplura or sucking lice (pp. 1–4); the anatomy (pp. 5–22), biology (pp. 23–53), medical importance (pp. 54–81), and control of *Pediculus humanus* (pp. 82–92); and the crab louse (*Phthirus pubis*) (pp. 93–98). Methods of rearing, feeding, and infecting lice by rectal injection are included in an appendix. A list of 108 references is given.

**Biology and morphology of some North American Bittacidae (order Mecoptera),** L. R. SETTY (*Amer. Midland Nat., 23 (1940), No. 2, pp. 257–353, figs. 178*).—This report of studies of the biology and morphology of some North American Bittacidae or scorpion flies is presented with a list of 68 references.

**Field control of the codling moth by electric and other traps,** G. E. MARSHALL and T. E. HIENTON. (Purdue Univ.). (*Rural Electrif. Exch., n. ser., 3 (1940), No. 2, pp. 38, 39, figs. 2*).

**The present status of the codling moth in Indiana,** G. E. MARSHALL. (Ind. Expt. Sta.). (*Ind. Hort. Soc. Trans., 1939, pp. 77–83*).

**Practical supplementary measures in codling moth control,** J. O. PEPPER. (Pa. State Col.). (*Pa. State Hort. Assoc. Proc., 81 (1940), pp. 67–69*).

**The migration of codling moth larvae from one apple to another,** W. G. GARLICK (*Canad. Ent., 72 (1940), No. 4, p. 87*).—The author reports having clearly proved that codling moth larvae will leave one apple and enter another, that this happens much more frequently than at first supposed, and that it involves larvae in all stages of growth. Its importance lies mainly in the fact that partly grown larvae are not apt to be poisoned on entering fresh fruit no matter how much spray may be on the latter, thus two or more fruits may be ruined by a single larva. Further, since migration always takes place in the dark, there is less danger to the exposed larva from predators. An accompanying note by Garlick and H. R. Boyce records the observation that in the majority of cases larvae seeking places to spin up leave the fruit only during darkness.

**Spraying for grapeberry moth control, 1939,** R. HUTSON (*Michigan Sta. Quart. Bul., 22 (1940), No. 4, pp. 263–265*).—A tabulation of experimental spraying conducted at Paw Paw in 1939 reveals calcium arsenate to be as effective against the grape berry moth as lead arsenate used in the same way. It is pointed out that the use of calcium arsenate offers a possibility of cutting the cost and eliminating the lead residue. It is also apparent that the fixed nicotine and cuprous cyanide offer alternatives and that the controls obtained with these materials, particularly the fixed nicotines, are satisfactory.

**Preliminary studies of the nutritive requirements of the European corn borer,** G. T. BOTTGER. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 4, pp. 249–257*).—Preliminary studies of the nutritive requirements of the European corn borer that consisted in feeding test larvae different kinds and forms of plant tissue selected to represent different types in physical structure, stage of maturity, chemical composition, and both resistant and susceptible strains of corn are reported. Approximately 400 corn borer eggs incubated until ready to hatch were employed to infest each food medium for testing its

nutritive effects on the survival, weight, and pupation of larvae under controlled laboratory conditions. As measured by statistically significant physiological differences, food materials rich in glucose fulfilled the borer's nutritive requirements far better than did those containing high percentages of either sucrose or starch. Supplementary tests for enzymes in the cellular tissue of the digestive tracts of hibernating larvae indicated the presence of both sucrose- and protein-splitting enzymes. No enzymes capable of hydrolyzing starch were found. Physical characters of plants which were associated with low survivals and weights of larvae were profuse pubescence, thick epidermis, and the greater number and coarse nature of fibrovascular bundles, especially in the peripheral region of the stems.

**Experimental infection of Hyphantria cunea with Nosema bombycis,** R. R. Kudo and J. D. DeCoursey. (Univ. Ill.). (*Jour. Parasitol., 26 (1940), No. 2, pp. 123–125*).—An infection test revealed that the fall webworm is easily parasitized by *Nosema bombycis* when mature spores are ingested. Heavily infected larvae show symptoms characteristic of pébrine in silkworms. Schizogony and sporogony in *H. cunea* are similar to those known to occur in *Bombyx mori*.

**Cutworm injury controlled by use of poisoned bait,** C. Lyle (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 4, p. 7*).

**The relation of shade to Anopheles quadrimaculatus breeding: A preliminary report,** E. H. Hinman and H. S. Hurlbut (*Jour. Parasitol., 26 (1940), No. 2, pp. 145–156, figs. 3*).—In work reported the common malarial mosquito has been reared through its entire life cycle in an incubator room at 20° C. in the complete absence of light.

**The life history of Leptocera digitata Duda (Diptera: Borboridae),** M. Hafez (*Bul. Soc. Fouad 1. Ent., 23 (1939), pp. 326–332, figs. 7*).

**The life history of Sepsis impunctata Macq. (Diptera: Sepsidae),** M. Hafez (*Bul. Soc. Fouad 1. Ent., 23 (1939), pp. 319–325, figs. 5*).

**A hormone which induces pupation in the common house fly (Musca domestica Linn.),** P. De Bach. (Calif. Citrus Expt. Sta.). (*Ann. Ent. Soc. Amer., 32 (1939), No. 4, pp. 743–746*).

**The Lemna fly and some of its parasites,** M. B. Scotland (*Ann. Ent. Soc. Amer., 32 (1939), No. 4, pp. 713–718*).—A report of observations of the dipteron *Lemnaphila scotlandae* Cress., an obligate resident of duckweed (*Lemna minor*), with notes on its parasites, including *Opius lemnaphilae* Mueseb., *Trichopria angustipennis* Mueseb., and *T. paludis* Mueseb.

**New North American Siphonaptera,** H. E. Ewing. (U. S. D. A.). (*Biol. Soc. Wash. Proc., 53 (1940), pp. 35–37*).—The genera *Paratyphloceras* and *Aptilopsylla* are erected, with *P. oregonensis* n. sp. from mink, Mercer Lake, Oreg., and *A. carlsbadensis* n. sp. from an unknown host, Carlsbad, N. Mex. The subgenera *Euhoplopsyllus* and *Acediopsylla* are erected, of which *Hoplopsyllus affinis* Baker and *Ctenocephalus inaequalis* Baker, respectively, are type species.

**Methods of collecting and shipping Larra americana Sauss., a parasite of the Puerto Rican mole-cricket,** L. F. Martorell. (P. R. Col. Expt. Sta.). (*Ann. Ent. Soc. Amer., 32 (1939), No. 4, pp. 703–712, figs. 8*).

**Field movement of sugar cane beetle borer adults,** R. H. Van Zwaluwenburg and J. S. Rosa (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 44 (1940), No. 1, pp. 3–6*).—In order to obtain information on the distance and rate of the adult New Guinea sugarcane weevil movement, the influence of prevailing winds, etc., an experiment was commenced in February 1939 and carried on in continuation of earlier work at Kailua (E. S. R., 80, p. 374). It

has shown that there is a constant movement of the weevils to and from the cane fields. The adults move mainly by flight for considerable distances to a known maximum of about one-third of a mile. "Winds are probably the main influence affecting their field movement. In the absence of air currents beetles fly in any direction, but even light winds appear to influence the direction, extent, and rate of their movement. Heavy winds probably carry them long distances. Adult borer beetles can survive in the field for 176 days, or 25 weeks, and may live even longer. Borer damage to each crop of cane in a given field is independent of the preceding infestation in the same field. Infestation is begun by beetles coming into the field from adjacent fields and is not continued from crop to crop by beetles bred in that particular area. Infestation begins only after the plants have formed cane. At Kailua this occurred in ratoon cane between 5 and 6 mo. of age."

**A destructive infestation in lodgepole pine stands by the mountain pine beetle,** J. C. Evenden and A. L. Gibson. (U. S. D. A.). (*Jour. Forestry, 38 (1940), No. 3, pp. 271–275, figs. 2*).—A brief history is given of the destruction of standing timber resulting from an outbreak of the mountain pine beetle in lodgepole pine stands of the Beaverhead National Forest, Mont. It was shown that during the past decade this outbreak has swept through an area of 1,341,860 acres, killing approximately 57,756,000 trees above 3 in. in diameter. The total loss of merchantable trees 9 in. and above in diameter at breast height is estimated at 77.3 percent.

**The life history of Philonthus quisquiliarius Gyllh. (Coleoptera: Staphylinidae,** M. Hafez (*Bul. Soc. Fouad I. Ent., 23 (1939), pp. 302–311, figs. 8*).

**The life history of Sphaeridium scarabaeoides L. (Coleoptera: Hydrophilidae),** M. Hafez (*Bul. Soc. Fouad I. Ent., 23 (1939), pp. 312–318, figs. 6*).

**A new phytophagous lady beetle in the Philippines,** S. S. Gonzales (*Philippine Jour. Agr., 10 (1939), No. 4, pp. 415–417, pls. 3*).—A brief account is given of the coccinellid beetle *Plagiodera metallica* Er., which for some time has been seriously injuring the Governor plum or cerali *Flacourtia indica* (Burm. fil.) Merr. in the Los Baños Economic Garden.

**Vertical migration of Japanese larvae,** A. Hartzell and G. F. McKenna (*Contrib. Boyce Thompson Inst., 11 (1939), No. 1, pt. 1, pp. 87–91, figs. 2*).—It was found that "daily air temperatures influence the movement of Japanese beetle larvae in soil, but vertical migrations of the larvae were from 4 to 6 days behind temperature fluctuations. In general, the movement was only a few inches, although the greatest vertical movement observed was 11.5 in. The probable average movement for individual larvae was between 4 and 7 in. There appears to be a correlation between mean air temperature up to about 60° F. and mean depth of the larvae. Lateral movement seems to take place as the grubs move out of the injured areas to areas of good turf."

**Methyl bromide as a fumigant.—A preliminary report,** D. B. Mackie and W. B. Carter (*Calif. Dept. Agr. Bul., 26 (1937), No. 2, pp. 153–162, figs. 4*).—A preliminary report is made of the results of a series of investigations of methyl bromide ($CH_3Br$ 99.5 percent) as an insecticide that are in the nature of range finding tests. The details of the tests to which the several stages of many insect species and plant forms were submitted are given in table form.

**Methyl bromide fumigation for Japanese beetle control,** H. C. Donohoe, A. C. Johnson, and J. W. Bulger. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 2, pp. 296–302*).—Need for means of freeing fresh fruits and vegetables for shipment to points outside infested areas during the period of adult activity led to the investigation of methyl bromide here reported, in continuation of the work by Mackie and Carter above noted. As a result commercial bases for application have been developed for use both in fumigation vaults and in loaded

refrigerator cars. "In especially constructed fumigation vaults it has been shown that complete mortality of Japanese beetle adults can be obtained in both vault space and load in fumigations with a 2-hr. exposure period, and that dosage is dependent upon temperature. Complete mortality was obtained with dosages of 2 lb. of methyl bromide per 1,000 cu. ft. at 65° to 90° F., of 1 lb. at 76° to 89°, and of 0.75 lb. at 77° to 86°. These are the results obtained in experimental fumigations involving 108,000 beetles. A successful method for fumigating loaded refrigerator cars was developed in 1938 and put into immediate commercial use. The treatment requires the use of a multivane blower with an air blast rating of 700 cu. ft. per minute free air, the introduction of a part of the dosage into each bunker of the car, and the release of methyl bromide through a disc-type spray nozzle. As used commercially in 1938 the nozzle was directed downward, and in 1939 upward to discharge toward the ceiling. Work in 1939 indicates that a dosage of 3.5 to 4 lb. per car at temperatures of 80°, or above, results in complete mortality. In the experimental car fumigations, over 5,000 grubs and about 110,000 adults of the Japanese beetle were used. The treatment has been commercially applied to almost 4,000 cars of produce during the 1938 and 1939 seasons of beetle activity."

**Tests on certain organic compounds for control of adult Japanese beetle,** A. Hartzell and Frank Wilcoxon (*Contrib. Boyce Thompson Inst., 11 (1939), No. 1, pt. 1, pp. 83–86*).—Report is made of preliminary tests of a number of organic compounds as possible contact insecticides for the control of the adult Japanese beetle. "Tergitol 7 penetrant, a sulfated alcohol, can function both as a solvent and as a spreading agent for pyrethrum resins and possesses definite insecticidal properties of its own. It is an excellent spreading agent for pyrethrum sprays made up in acetone and methyl isobutyl ketone. Tergitol 7 penetrant at a concentration of 0.5 percent gave a kill of adult Japanese beetle of about 50 percent. An aqueous solution containing 0.02 percent of total pyrethrins and 0.5 percent Tergitol 7 penetrant gave a satisfactory control of the adults (85–100 percent kill). Plant tolerance to these sprays has been tested on 26 species of plants, of which 21 species were tolerant, 1 species was severely injured, and 4 species only slightly injured."

**The life history of Aphodius lividus Oliv. (Coleoptera: Scarabaeidae),** M. Hafez (*Bul. Soc. Fouad 1. Ent., 23 (1939), pp. 288–300, figs. 9*).—The morphology and biology of this scarabaeid is presented, with 15 references.

**The depletion of starch from timber in relation to attack by Lyctus beetles, III, IV** (*Forestry, 12 (1938), No. 2, pp. 117–124, fig. 1; 13 (1939), No. 2, pp. 134–145*).—Two further contributions (E. S. R., 80, p. 520) are presented: A Second Experiment Upon the Girdling of Standing Oak Trees, by E. A. Parkin, and A Third Experiment on the Girdling of Standing Oak Trees, by E. A. Parkin and E. W. J. Phillips.

**Mid-summer sprays with lead arsenate to control the hickory bark beetle,** E. I. McDaniel (*Michigan Sta. Quart. Bul., 22 (1940), No. 4, pp. 243–245*).—This is a brief practical account of the midsummer use of lead arsenate for controlling hickory bark beetles. One thorough application, 4 lb. in 100 gal. of water plus a sticker-spreader, proved effective because timeliness is the important element in effecting control of this pest with sprays.

**Control measures for the plum sawfly Hoplocampa fulvicornis** [trans. title], P. Bovien and C. Stapel (*Tidsskr. Planteavl, 44 (1940), No. 4, pp. 700–730, figs. 5; Eng. abs., p. 729*).—In field work with the plum sawfly, a serious pest in Denmark, Quassia yielded excellent results, and was far superior to nicotine, lead arsenate, cryocid (natural cryolite), and derris.

**Ticks (Ornithodoros spp.) in Arizona bat "caves"**, C. B. PHILIP (*Pub. Health Rpts. [U. S.], 55 (1940), No. 16, pp. 680–682*).

**Eriophyid studies, VIII**, H. H. KEIFER (*Calif. Dept. Agr. Bul., 29 (1940), No. 1, pp. 21–46, figs. 22*).—This further installment of the series of contributions (E. S. R., 82, p. 803) includes descriptions and illustrations of 22 additional species, of which 20 are described as new.

## ANIMAL PRODUCTION

**[Experiments with livestock in Hawaii]** (*Hawaii Sta. Rpt. 1939, pp. 19, 26–31, 79–82, figs. 3*).—Brief progress reports (E. S. R., 81, p. 687) are presented for the following investigations: Comparative palatability of forage grasses, by R. A. Lyman and J. C. Ripperton; the value of molasses as a supplement to Napier grass, and a comparison of Rhodes grass and Sudan grass for dairy cows, both by L. A. Henke and C. I. Maruyama; soybean oil meal v. cottonseed meal as protein supplements for milking cows, by Henke and S. H. Work; the value of cane molasses for the pasture fattening of beef cattle, by Henke, Work, and A. W. Burt; a comparison of fish meal, roasted soybeans, and soybean oil meal as protein supplements in swine rations, the value of algarroba beans for fattening swine, the use of avocados, papayas, and pineapple bran in swine rations, and the utilization of urea nitrogen by cattle and by swine, all by Work and Henke.

From experiments with poultry, results are noted on the rate and efficiency of gain of New Hampshire chickens, the egg production of Japanese Shamo Game pullets, the comparative fertility and hatchability of eggs from hens in cages and on the ground, all by C. M. Bice; and the utilization of urea nitrogen by chickens, and the salt balance of molasses feed for poultry, both by Bice and L. A. Dean.

**[Livestock investigations in Kentucky]** (*Kentucky Sta. Rpt. 1939, pt. 1, pp. 10–13, 22–24, 54, 55, 56*).—Results are briefly presented for the following lines of investigation: A comparison of alfalfa-molasses silage and alfalfa hay as roughages for dry-lot fattening of steers; comparative analyses of corn, red clover, and alfalfa silages; a mixture of distillers' corn dried grains and tankage v. cottonseed meal as protein supplements for fattening steers; distillers' corn dried grains v. cottonseed meal for pregnant and nursing beef cows; beef production per acre of variously fertilized permanent pastures; lespedeza hay v. alfalfa hay for bred ewes; rye v. bluegrass pasture for breeding ewes; a comparison of rations for creep-fed lambs; the quality of lambs produced by individuals representing the five most common types of western ewes; continuous v. rotational grazing of bluegrass pastures for ewes and their lambs and for dairy heifers; tankage v. a mixture of tankage and soybean oil meal in swine rations; a comparison of pasture crops for hogs; the optimum date at which to discontinue turning turkey eggs during incubation; the use of body measurements for predicting quality of turkey carcasses; the relation of the quality of protein in meat scrap to rate of growth of chicks; characteristics of the oil of the uropygial gland in chickens and turkeys; a comparison of feeding methods for laying pullets; and free-choice feeding v. all-mash feeding for chicks.

**[Livestock investigations in Mississippi]** (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), Nos. 4, pp. 2, 7, 8; 5, pp. 2, 7*).—The results of experiments with livestock are briefly reported in articles as follows: No. 4, Grazing, Balanced Ration, Produced Economical Pork, by P. G. Bedenbaugh; Silage Economical, Fits Well Into the Dairy Program, by J. S. Moore; Lespedeza Hay Found Satisfactory for Wintering Mature Beef Cows and Yearling Heifers in 1940 Test,

by A. E. Cullison; Substitutes for Dried Milk in Poultry Feeding, by G. R. Sipe; No. 5, Holding Turkeys for the Spring Market at Present Price Level Unsound for Toms, Depends on Value of Eggs Produced by Hens, by G. R. Sipe; Profit on Lambs Depends Largely on Early Weaning, by H. H. Leveck; and Wheat Shorts for Feeding Pigs—Price, Finish Are Factors, by P. G. Bedenbaugh.

**[Livestock investigations in Nevada]** (*Nevada Sta. Rpt. 1939, pp. 24, 36–38, figs. 1*).—Included are progress reports on the use of barley as a supplement to alfalfa for range ewes and lambs, by C. E. Fleming; and the rate and economy of gain of purebred v. crossbred pigs, comparative values of first-, second-, and third-cutting hay for steer feeding, and variations in earliness of maturity and size and quality in four strains of turkeys, all by F. B. Headley.

**[Livestock investigations in Ohio]** (*Ohio Sta. Bul. 600 (1939), pp. 51–53, 54, 55, 56, 57*).—Included are brief reports on the effect of decreasing corn and increasing hay in the rations of fattening yearling steers, the desirability of limiting coconut oil meal for pigs, the value of iron-treated cottonseed meal as a partial source of protein for pigs, the value of dried skim milk for young pigs, a comparison of hybrid and open-pollinated corn for swine, cross-breeding tests with swine, the toxicity of gossypol for pigs and guinea pigs, the influence of various concentrates in the ration on the occurrence of "apoplexy" in fattening lambs, the livability and egg production of pullets as affected by previous management, and the riboflavin requirement of the chicken and effective sources and levels of this substance in the poultry ration.

**[Experiments with livestock in South Carolina]** (*South Carolina Sta. Rpt. 1939, pp. 82, 85–87, 93–95, 100–104*).—Results are briefly reported for the following lines of investigation, by E. G. Godbey, L. V. Starkey, E. D. Kyzer, R. L. Jones, and G. W. Anderson: Cottonseed meal and hulls v. corn and lespedeza hay for fattening steers; a comparison of rye (pasture) v. sorghum silage in wintering stocker steers; the value of pearl millet as a temporary pasture for beef cattle; the rate and economy of gains of crossbred v. purebred pigs; the relative value of menhaden fish meal, meat-and-bone scraps, tankage, and sardine meal as protein supplements for fattening pigs on rye pasture; and the relation of economy of gain in fattening swine to certain morphological and physiological factors.

Reports of poultry investigations, by C. L. Morgan, R. C. Ringrose, J. H. Mitchell, and E. J. Lease, include the deleterious effect of cottonseed oil on hatchability of eggs and the effect of various fractions of the oil in this regard, and the value of sweetpotato flour as a source of carotene for chickens.

**[Livestock investigations in Tennessee].** (Partly coop. U. S. D. A. et al.). (*Tennessee Sta. Rpt. 1938, pp. 4–7, 34–40, 41, 42, 81–83, 89, figs. 2*).—Experiments at the main and branch stations, for which results are briefly reported, include: The costs and profitableness of acre-beef yields from corn harvested in various forms and fed in various forms and combinations, the feed requirements for fattening 2-year-old steers on pasture, the comparative value of shelled corn, ground shelled corn, and corn-cob-shuck meal for winter finishing of baby beeves, silage v. alfalfa hay for fattening yearling steers, and cottonseed meal alone v. mixtures of protein concentrates as supplements to silage for fattening steers, all by M. Jacob; the economy of beef production on bluegrass, alfalfa, and clover pastures, by L. R. Neel and F. S. Chance; the effect of nitrate fertilization on the carrying capacity of permanent pastures, the effect of shade trees on the carrying capacity of permanent pastures, and the effect of stage of maturity on the pasture value of lespedeza, all by Neel; the value of grain feeding for breeding ewes in the production of early spring lambs, and corn v. barley for fattening pigs on crimson clover or crimson clover plus ryegrass

pastures, both by Jacob; the availability of phosphorus in *Lespedeza sericea* and alfalfa hays of varying phosphorus content, by D. E. Williams and E. Morrell; and the utilization of legume silage as a feed for poultry, by P. W. Allen and Jacob.

[**Livestock investigations in Wyoming**]. (Partly coop. U. S. D. A.). (*Wyoming Sta. Rpt. 1939, pp. 11–13, 22, 23, 32, 34, 36, 37, 39*).—Investigations at the central and substations, for which results are briefly reported, include: The effect of phosphorus deficiency in the ration of beef heifers; a comparison of chopped corn fodder, native hay, and native hay plus cottonseed meal for wintering beef calves; wet beet pulp v. corn silage, each with and without cottonseed meal as a supplement, and other comparisons of rations for fattening beef steers; the rate and economy of gain of Hereford steers representing three selected blood lines; soybean lecithin as a supplement to hay and barley for sheep; the wool- and mutton-producing qualities of crossbred sheep resulting from the crossing of native ewes with Corriedale, Columbia, Romney, and Lincoln rams; lamb feeding experiments, including the use of sugar beet byproducts, Russian-thistle hay, Sudan grass hay, alfalfa, corn silage, and concentrates in various combinations; factors affecting the shrinkage of wool and wool-sampling methods; the value of skim milk in pig feeding; a comparison of alfalfa pasture v. dry lot for fattening pigs on corn and tankage; the influence of types of poultry house, artificial lighting, and artificial heating on the rate and economy of egg production; the relative cost of raising pullets in sexed and unsexed groups; the comparative effects of different cereal grains on the growth and quality of turkeys; and the value of rye for turkeys.

**Comparison of a chemical and a biochemical method for determining the biological value of proteins and an evaluation of the endogenous nitrogen,** F. C. OLSON and L. S. PALMER. (Minn. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 5, pp. 331–342, figs. 4*).—Using the nitrogen-retention method of Mitchell and Carman (E. S. R., 56, p. 188), the following biological values for proteins from different sources were obtained: Whole egg 94, casein 63, whole wheat 47, wheat gluten 42, whole corn 52, corn-gluten meal 42, liver meal 56, meat-and-bone tankage 38, solvent-extracted soybean meal 61, and heated solvent-extracted soybean meal 68. The protein quality index of the same foods was determined by the chemical method of Almquist et al. (E. S. R., 74, p. 529). These values showed no comparison with the biological values in case of the isolated proteins. For the natural foodstuffs the comparison was fair providing the enzymatic digestion most similar to that in vivo was used for calculating the protein index value. No difference was found in the digestion of raw and heated soybean meal, although the latter showed a higher biological value. Correction of the endogenous urinary nitrogen according to body surface was found to give less variation than correction according to body weight.

**Tomato pomace in the diet,** C. M. McCAY and S. E. SMITH. (Cornell Univ. and U. S. D. A.). (*Science, 91 (1940), No. 2364, pp. 388, 389*).—Tomato pomace of relatively high initial carotene content when held for 1 yr. at room temperature showed no evidence of rancidity and very little decrease in carotene content. One hundred mg. daily per animal of either fresh or aged material provided an adequate amount of vitamin A for normal growth and maintenance of rats. In feeding tests with dogs, foxes, and minks tomato pomace at a 5-percent level in the ration had a very beneficial effect on the character of the feces.

**Vitamin A content of the livers of a hundred healthy dogs,** R. G. LINTON and A. BROWNLEE (*Nature [London], 144 (1939), No. 3658, pp. 978, 979*).—Livers obtained from healthy dogs of varying age and condition were found to contain an average of 678 blue units per gram. However, wide individual variations were noted and the medial figure based on the average of the six central figures

was 153.5 blue units per gram. There appeared to be no association between the vitamin A reserve and the body condition of the dogs.

**The vitamin A activity and the vitamin $B_1$ content of soybeans and cowpeas,** J. O. HALVERSON and F. W. SHERWOOD. (N. C. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 2, pp. 141–144*).—Employing the rat-growth technic, nine common varieties of soybeans and eight of cowpeas (mostly from a local seed store) were assayed for vitamin A and vitamin $B_1$. None of the varieties of either plant contained appreciable quantities of vitamin A, the maximum content recorded being 1.3 International Units per gram. The soybeans contained from 3.2 to 4.8 (average 3.8) I. U. of vitamin $B_1$ per gram, and the cowpeas from 2.3 to 3.7 (average 3) I. U. per gram. There were no marked differences between varieties.

**The production of uncomplicated riboflavin deficiency in the dog,** A. E. AXELROD, M. A. LIPTON, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Amer. Jour. Physiol., 128 (1940), No. 4, pp. 703–708, figs. 2*).—A basal ration composed of purified casein, sucrose, cod-liver oil, and salt mixture was found to be adequate for growing dogs when supplemented with thiamin, nicotinic acid, vitamin $B_6$, riboflavin-free liver extract, and riboflavin. When riboflavin was omitted from the diet an acute characteristic deficiency syndrome was produced in from 6 to 8 weeks. If administered sufficiently early in the development of this syndrome, the riboflavin supplement exerted a marked curative effect.

**The biological activity of synthetic pantothenic acid,** H. H. WEINSTOCK, JR., A. ARNOLD, E. L. MAY, and D. PRICE (*Science, 91 (1940), No. 2365, p. 411*).—Using a microbiological assay method, good agreement was obtained between the expected values for the biological activity of pantothenic acid as supplied by rice bran filtrate and that supplied as a crude synthetic product. The yield of pantothenic acid of the synthetic material was approximately 25 percent.

**Further studies on the effectiveness of arsenic in preventing selenium poisoning,** K. P. DUBOIS, A. L. MOXON, and O. E. OLSON. (S. Dak. Expt. Sta.). (*Jour. Nutr., 19 (1940), No. 5, pp. 477–482, fig. 1*).—Continuing this series of investigations (E. S. R., 82, p. 660), rats receiving from 14 to 18 p. p. m. of selenium in their diet in the form of seleniferous wheat were fully protected against selenium toxicity by adding 10 p. p. m. of arsenic in their drinking water supplied either as sodium arsenite or sodium arsenate. The addition of 5 p. p. m. of arsenic from these sources gave only partial protection. Arsenic in the form of sulfides was ineffective in this respect. Arsenic as sodium arsenite was equally effective against selenium supplied as seleniferous wheat, sodium selenite, or selenium-cystine. The response to arsenic supplement varied with the length of time the animals had received selenium before arsenic administration. The arsenic was effective when rats had received selenium for 20 days but was of little value after 30 days of selenium feeding.

**Boron in animal nutrition,** E. HÖVE, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Amer. Jour. Physiol., 127 (1939), No. 4, pp. 689–701, figs. 2*).—A colorimetric method for determining boron in biological materials is described. Employing this technic a large number of milk and egg samples were analyzed. No significant breed differences in boron content of milk were observed, but it was found possible to markedly increase the boron content of milk by feeding boric acid. Likewise, the boron content of eggs was greatly increased by increasing the boron content of the ration, although the ratio of boron in the white to that in the yolk (8–10:1) was not altered. Preliminary feeding trials with rats indicated that ingested boric acid is eliminated very rapidly. Addition of boron to milk or to a dry ration providing only 0.8 $\mu g$. of boron per animal daily did not improve the growth rate of young rats.

*indicating that if boron is required for this species the requirement is relatively very low.*

**Beef production in California,** H. R. Guilbert and L. H. Rochford. (Coop. U. S. D. A.). (*Calif. Agr. Col. Ext. Cir. 115* (*1940*), *pp. 125, figs. 25*).—"This circular deals with the principal factors that influence beef-cattle production, management, and marketing practices in California, and the efficiency of the animals in performing their specific functions." The physical conditions and economic background influencing the industry and the methods used by stockmen, the general requirements for proper nutrition of beef animals, and the characteristics of the principal feeds grown in the State are described. Management of a breeding herd and young animals for production of feeder cattle, and the fundamental principles to be observed in finishing beef cattle are discussed and suggestions and recommendations made.

**The digestibility of ground prunes, winery pomace, avocado meal, asparagus butts, and fenugreek meal,** A. H. Folger (*California Sta. Bul. 635* (*1940*), *pp. 11*).—Employing wether sheep as test animals as in earlier trials (E. S. R., 56, p. 261), coefficients of digestibility were determined for dried prunes, winery pomace, avocado meal, and asparagus butts. The calculated digestible crude protein and total digestible nutrient values for these products are as follows: Prunes 0.7 and 66.1, winery pomace (samples A and B) 1.3 and 24.5, winery pomace (sample C) 1.9 and 30.7, solvent-extracted avocado meal 9 and 57.3, and asparagus butts 9.7 and 47.1. The fenugreek meal because of its laxative properties could not be fed in sufficient quantities to yield accurate data on its digestibility. The prunes were very palatable, avocado meal and asparagus butts reasonably palatable, and the winery pomace was readily consumed by sheep but was not relished by cows.

**Rice and rice products for fattening lambs,** M. G. Snell and F. L. Morrison. (La. Expt. Sta.). (*Rice Jour., 43* (*1940*), *No. 4, pp. 13, 14*).—In the lamb feeding experiments described ground corn was compared with a number of rice products. Rice straw, cottonseed meal, a small amount of alfalfa hay, and minerals were common to all rations. Comparative values based on the amount of concentrate required per 100 lb. of gain, with corn assuming the value of 100, were for ground rough rice 76, chicken feed rice 102, rice polish 73, rice bran 32, and mixtures of rice polish and rice bran from 59 to 63. Lambs receiving corn and chicken feed rice made average daily gains of 0.25 and 0.26 lb., respectively. Lambs on the other rice products made somewhat slower though reasonable gains, except those receiving rice bran which gained an average of only 0.09 lb. per head daily.

**The synthesis of nicotinic acid in the body of sheep,** A. H. Winegar, P. B. Pearson, and H. Schmidt. (Tex. Expt. Sta.). (*Science, 91* (*1940*), *No. 2369, pp. 508, 509*).—Lambs maintained on a nicotinic acid deficient basal diet for a period of approximately 8 mo. were found to yield significant quantities of nicotinic acid in their urine, the quantity being of a similar magnitude to that in lambs receiving nicotinic acid supplements in their diet. It appeared that synthesis of this substance occurs in the body of the sheep.

**Estimates of value of wool based on grease weights unreliable,** M. Madsen (*Farm and Home Sci.* [*Utah Sta.*], *1* (*1940*), *No. 2, p. 7, fig. 1*).—Comparisons of average shearing weights and scoured weights of fleeces from range and farm groups of sheep over an 8-yr. period showed an advantage in shearing weight of farm flocks in 6 of the 8 yr. The average wool shrinkage was 66 and 59 percent for range and farm, respectively. It is concluded that the usual practice of wool buyers to pay higher prices for range wool than for farm wool is unjustified.

**Studies on the bacteriology of Wiltshire bacon.—I, Methods for quantitative analysis of curing pickle,** G. B. LANDERKIN (*Food Res., 5 (1940), No. 2, pp. 205–214, figs. 4*).—Summarizing the results of 5 years' study by the Science Service, Department of Agriculture, Canada, it was found that the flora of Wiltshire pickle is heterogeneous and requires at least two media for its enumeration, i. e., a nutrient agar to indicate the degree of contamination and 10-percent salt agar to reveal the natural or halophilic flora. With either nutrient agar or 5-, 10-, and 15-percent salt agars higher counts were obtained at an incubation temperature of 20° C. than at 37° or 5°. The limitations of other media tested are discussed.

**Capon production in South Dakota,** W. E. POLEY (*South Dakota Sta. Bul. 335 (1940), pp. 31, figs. 13*).—In addition to a general discussion of caponizing and the feeding, management, and marketing of capons, the results of experiments to determine the effect of production cost factors upon market profits from capons and to compare the business of producing capons with that of producing cockerels for roasters are summarized. The net returns from capons varied considerably over a period of 4 yr., mortality, feed costs, rate of growth, weight at marketing time, and meat prices, all having an appreciable effect on the labor income from capon production. The average weight of feed consumed per pound of gain was 8 and 8.3 lb. for cockerels and capons, respectively. The average mortality of all birds reared was 16.5 and 22 percent for cockerels and capons, respectively. Under the conditions of these trials the production of capons proved more profitable than the production of cockerels for roasters.

**Factors affecting the market quality of poultry meat,** W. A. MAW (*U. S. Egg and Poultry Mag., 46 (1940), No. 7, pp. 412–414, 445–448, fig. 1*).—A general summary, with 27 references to the literature (E. S. R., 83, p. 388).

**The effect of cold drinking water on chick growth and yolk absorption,** B. W. HEYWANG. (U. S. D. A.). (*Poultry Sci., 19 (1940), No. 3, pp. 201–204*).—In a series of short-time tests at the Southwest Poultry Experiment Station, Glendale, Ariz., young chicks were allowed access to warm drinking water (75°–90° F.) v. chilled drinking water (slightly above 32°). The drinking of cold water did not interfere with the normal absorption of yolk material or adversely affect the growth of young chicks. There was no significant difference in the average feed required per unit of gain in the two lots.

**The influence of whole wheat, bran, and shorts on body weight and feather growth in chicks,** F. E. MUSSEHL, C. W. ACKERSON, and M. J. BLISH (*Nebraska Sta. Res. Bul. 119 (1940), pp. 11, figs. 5*).—Fed as supplements (equivalent protein basis) to a basal ration containing corn, barley, oats, meat scrap, fish meal, and soybean meal, the proteins of the whole wheat kernel, bran, and shorts were apparently utilized with equal efficiency by growing chicks. In another series in which the vegetable constituents of the basal ration were autoclaved, the chicks receiving bran as a supplement showed markedly superior feather development, while those on shorts were intermediate in this respect and those on whole wheat were poorly feathered. However, growth was more rapid among chicks receiving shorts, followed in order by those on bran and whole wheat.

**The essential nature of a new growth factor and vitamin $B_6$ for chicks,** D. M. HEGSTED, J. J. OLESON, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Poultry Sci., 19 (1940), No. 3, pp. 167–176*).—The results of a series of experiments employing six different simplified basal diets with numerous supplements are described. Evidence was obtained to indicate the requirement of the chick for a new growth factor which is distinct from factor U, chondroitin, arginine,

or any of the water-soluble factors recognized as being required by the chick or rat. Certain properties of the factor are described, but efforts to concentrate it from kidney or brain tissue or from wheat middlings have been unsuccessful to date. It was further shown that vitamin $B_6$ is required by the chick for maintenance and growth. Two other deficiency symptoms encountered in this trial are described, one a characteristic spastic paralysis, the other yellow livers which are not associated with any deficiency known to cause fatty degeneration.

**The cannibalism preventing properties of the fiber fraction of oat hulls,** G. E. BEARSE, V. L. MILLER, and C. F. MCCLARY. (West. Wash. Expt. Sta.). (*Poultry Sci., 19 (1940), No. 3, pp. 210–215*).—Continuing this series (E. S. R., 80, p. 674), efforts were directed toward determining what fraction of the oat hull prevented or retarded development of cannibalistic tendencies in chickens. Oat hull fiber obtained by dilute acid digestion of oat hulls fed at a level to provide 11 percent fiber in the complete ration effectively controlled cannibalism and improved feather development. Neither oat hull ash nor the dilute acid extract were of significant value in preventing cannibalism.

**The pH and cloudiness of egg albumen in relation to albumen quality,** L. A. WILHELM. (Wash. Expt. Sta.). (*U. S. Egg and Poultry Mag., 46 (1940), No. 7, pp. 397–401, figs. 2*).—Determination of the pH of various fractions of strictly fresh eggs gave the following values: Thin albumen 7.9, thick albumen 7.76, albumen with yolk removed 7.62, albumen still containing the yolk 7.61, and yolk 5.94. A study was made of the albumen quality of some 400 eggs ranging from 0 to 21 days of age as related to pH and cloudiness of albumen. The albumen index declined ±10 percent during the first 24 hr. after the eggs were laid, this drop being closely associated with loss of $CO_2$ as measured by pH of albumen. Cloudiness of albumen appeared to be an indication of excellent interior egg quality, being associated with a low pH of albumen and a high albumen index and indicating freshness and/or that the egg had been held at low temperatures.

**The porosity of the egg-shell in relation to hatchability,** C. D. MUELLER and H. M. SCOTT. (Kans. Expt. Sta.). (*Poultry Sci., 19 (1940), No. 3, pp. 163–166, fig. 1*).—Employing loss in egg weight per unit of shell area as a measure of eggshell porosity, it was found that the porosity of White Leghorn eggs was not correlated with hatchability. The average loss in weight for the eggs laid during the normal hatching season was 7.28 mg. per square centimeter of shell area (range 3.52–13.99) during the first 24 hr. of incubation. No correlation was found to exist between egg weight and loss in weight per unit of surface area.

**Malformation of the tarso-metatarsal and phalangeal bones of chicks,** L. C. NORRIS, C. D. CASKEY, and J. C. BAUERNFEIND. (Cornell Univ.). (*Poultry Sci., 19 (1940), No. 3, pp. 219–223, figs. 2*).—A deformity commonly called crooked toes, observed on poultry farms with increasing frequency in recent years, is described and illustrated. Experimental work on its cause revealed that the type of floor on which chicks are confined has a marked effect on the development of the disorder, smooth paper-covered floors resulting in a much higher incidence than hard wire-covered floors. The probable effect of inherent defects and nutritional deficiency on its development is discussed.

**The difference in serum calcium and inorganic phosphorus content of normal turkeys affected with a bone deformity,** H. M. NIELSEN and D. E. MADSEN. (Utah Expt. Sta.). (*Poultry Sci., 19 (1940), No. 3, pp. 198–200*).—Young turkeys suffering from a bone deformity similar to, if not identical with, perosis were found to have a significantly lower percentage of calcium and a higher percentage of inorganic phosphorus in the blood serum than normal birds. No explantation is offered regarding the manner in which these differences may relate to the development of the disorder (E. S. R., 83, p. 391).

**Utah conditions especially favorable for turkey production,** B. ALDER (*Farm and Home Sci.* [*Utah Sta.*], *1* (*1940*), *No. 2, pp. 3, 10, figs. 2*).—A general discussion of turkey production in Utah, with emphasis on the use of locally grown feeds.

## DAIRY FARMING—DAIRYING

**[Dairy cattle investigations in Kentucky]** (*Kentucky Sta. Rpt. 1939, pt. 1, pp. 21, 22*).—The results are briefly noted on factors responsible for delayed conception and sterility in dairy heifers, the effect of excitation on the ejection of milk from the bovine udder, and the bacterial and leucocyte content of aseptically drawn milk samples.

**Dairying in Mississippi agriculture,** J. S. MOORE and W. C. COWSERT (*Miss. Farm Res.* [*Mississippi Sta.*], *3* (*1940*), *No. 5, pp. 3–6, figs. 2*).—This article, which is a part of the director's annual report, summarizes the findings during the first 10 yr. on a 14.25-acre farm with 6 acres in pasture, 2 in cotton, and 6.25 acres in feed crops, with an average of 4.8 cows.

**[Dairy investigations in Ohio]** (*Ohio Sta. Bul. 600* (*1939*), *pp. 45–51, figs. 3*).—Included are brief reports on the quality and carotene content of silages other than corn in various types of silos and with various treatments, a rapid method for determining moisture in green roughages and hays, feeding milk fat substitutes to veal calves, raising heifer calves on limited amounts of whole milk, grain in pellet form v. meal for heifer calves, and the effect of vitamin A deficiency on the structure of the gonads and the pituitary gland.

**[Dairy cattle investigations in South Carolina],** G. H. WISE, J. P. LAMASTER, J. H. MITCHELL, and E. J. LEASE (*South Carolina Sta. Rpt. 1939, pp. 81, 82, 83, 84, 89–92, fig. 1*).—Brief progress reports (E. S. R., 81, p. 97) are presented on a comparison of rotational v. continuous grazing of Bermuda grass pastures, the relative quality and feeding value of corn-soybean silages and sorghum-soybean silages, the influence of these silages and of sweetpotato flour in the dairy ration on the carotene content of the butterfat produced, and a comparison of the open-pail v. nipple-pail methods of feeding milk to dairy calves.

**[Dairy cattle investigations in Tennessee]** (*Tennessee Sta. Rpt. 1938, pp. 83, 87, 88*).—Results are briefly presented on a comparison of winter pasture v. silage for milking cows, by L. R. Neel; and the quality and palatability of crimson clover silage, and the use of an all-roughage ration v. roughage and grain feeding for milking cows, both by B. P. Hazlewood.

**[Experiments with dairy cattle in Wyoming]** (*Wyoming Sta. Rpt. 1939, pp. 11, 24, 25*).—Results are briefly noted for the following investigations: The value of beet molasses as a supplement to native hay and to alfalfa hay, dried beet pulp v. sunflower silage as a supplement to native hay for dairy heifers, the economy of limited grain (barley) feeding v. a sole roughage ration for milking cows, and open-shed v. stable milking.

**Artificial insemination,** J. P. LAMASTER and G. W. ANDERSON (*South Carolina Sta. Rpt. 1939, pp. 88, 89*).—Artificial insemination proved successful with dairy cattle even following storage of semen for 24, 48, and 96 hr. under mineral oil and refrigeration.

**Absorptive capacity of different materials ordinarily used for bedding,** T. M. OLSON. (S. Dak. State Col.). (*Jour. Dairy Sci., 23* (*1940*), *No. 4, pp. 355–360*).—Ten-lb. samples each of whole and cut oat straw, wheat straw, rye straw, and of sawdust and shavings were allowed to soak in urine or in water for 2 hr., and then were weighed to determine their water-absorbing capacity. The various cereal straws were very similar in this respect, and no significant differences were noted between the absorptive capacity of the whole and cut

straws. The shavings absorbed less moisture than the straws, while the very dry sawdust absorbed somewhat more.

**Effects of feeding various lots of legume grass silage to dairy cattle,** A. R. SCHUBERT, B. R. CHURCHILL, and J. G. WELLS, JR. (*Michigan Sta. Quart. Bul., 22 (1940), No. 4, pp. 238–241*).—Five lots of grass-legume silages, varying as to stage of maturity, moisture content, and type of preservatives used, were compared in the trial reported. Three similar groups of dairy heifers and cows were fed (1) all silage, (2) half silage and half hay, and (3) all hay. All lots of silage were palatable and consumed with little refusal. Substituting silage for hay either in part or entirely did not produce any significant difference in body weights of the cows during the feeding trial. Heifers fed all silage made greater gains than those fed half silage and half hay and much greater gains than those fed all hay of a medium quality.

**A test of the economic efficiency of alfalfa hay as a sole ration for dairy cattle, and its relation to sterility,** F. B. HEADLEY (*Nevada Sta. Rpt. 1939, p. 36*).—A progress report.

**Bloat in dairy cattle,** T. M. OLSON. (S. Dak. Expt. Sta.). (*Jour. Dairy Sci., 23 (1940), No. 4, pp. 343–353*).—Data are presented on the analyses of rumen gases collected from cows (both live and dead) which had bloated on sweetclover or alfalfa, also on the composition of gases generated under laboratory conditions from a number of legumes and nonlegumes. No significant difference was noted in the composition of rumen gases from sweetclover and alfalfa or in the composition of gases from legume and nonlegume plants generated under laboratory conditions except for the relatively low percentage of carbon dioxide in gases from corn plants, marsh grass, and bromegrass. The rumen gases differed from those generated in the laboratory, mainly in their higher methane content. No single factor was found which would seem to explain the cause of bloat or the cause of death from bloat.

**Milk and butterfat production by dairy cows on four different planes of feeding,** R. R. GRAVES, G. Q. BATEMAN, J. B. SHEPHERD, and G. B. CAINE. (Coop. Utah Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 724 (1940), pp. 36*).—Of the four rations compared in this experiment the control ration consisted of full-grain feeding (1 lb. of grain for each 4.33 lb. of milk produced), with alfalfa hay, corn silage, and pasture in season. Ration 1 consisted of pasture in season and alfalfa hay; ration 2, ground barley at the rate of 1 lb. to each 6.03 lb. of milk produced, with alfalfa hay and pasture; and ration 3, alfalfa hay, corn silage, and pasture. Twelve Holstein cows each completed one full lactation on each of the above rations. Compared to the full-grain ration, ration 1 produced 69.8 and 65.8 percent; ration 2, 86 and 80.2 percent; and ration 3, 73.6 and 69.9 percent as much milk and butterfat, respectively (mature basis). The relatively low butterfat content of milk produced on rations 1, 2, and 3 is not in agreement with earlier trials conducted by the Bureau of Dairy Industry. The rate of decline in milk production after the month of highest production was more rapid on the high roughage rations than on the full-grain ration. The cows appeared to be more regular breeders and produced heavier calves while receiving the all-roughage rations than when on the rations containing grain.

**A rapid multiple color test for the approximation of available chlorine,** H. SCHARER (*Jour. Milk Technol., 3 (1940), No. 2, pp. 84–87, fig. 1*).—A colorimetric test for the approximation of available chlorine and which will distinguish between a hypochlorite and a chloramine is described.

**High-temperature (steam-injection) pasteurization of cream for buttermaking,** W. M. ROBERTS, S. T. COULTER, and W. B. COMBS. (Minn. Expt. Sta.). (*Jour. Dairy Sci., 23 (1940), No. 4, pp. 315–323, fig. 1*).—Duplicate samples of

sweet and of neutralized sour creams were pasteurized at 260° F. with a high-temperature steam-injection pasteurizer and at 160° for 30 min. in a vat pasteurizer, respectively. Both salted and unsalted butters prepared from creams pasteurized at high temperature received the same initial flavor score as those from the camparable lots of vat-pasteurized cream. Despite the lower initial bacterial counts neither the salted nor unsalted butter from the high-temperature cream kept better in storage at 40° than butter from the low-temperature cream. The high-temperature pasteurizer resulted in much greater losses of butterfat in the buttermilk than did the vat pasteurizer.

**Potentiometric studies with resazurin and methylene blue in milk,** C. K. JOHNS and R. K. HOWSON (*Jour. Dairy Sci., 23 (1940), No. 4, pp. 295–302, figs. 6*).—In studies by the Science Service, Department of Agriculture, Canada, a comparison of time-potential curves for milk, milk plus resazurin, and milk plus methylene blue showed that the curve for milk plus resazurin had a sharper initial drop in Eh than those for the other samples. This was followed by a flattening of the curve at a point near that at which the full pink color appeared. Later the curve again declined so that eventually all samples reached the same final Eh. Resazurin reduced to the pink stage in approximately three-fourths of the time required for methylene blue to decolorize, probably attributable to the change in shape of the time-potential curve in the presence of resazurin. Hourly inversion of the tubes during incubation generally shortened the reduction time of good milk considerably. Resazurin appeared more useful than methylene blue in detecting milk containing large numbers of weakly reducing organisms.

**"Oxidase reaction" of bacteria in relation to dairy products,** C. H. CASTELL and E. H. GARRARD (*Food Res., 5 (1940), No. 2, pp. 215–222*).—This contribution from the Ontario Agricultural College describes the oxidase, Gram, proteolytic, lipolytic, and other reactions of 30 pure cultures of bacteria. Organisms of the *Pseudomonas and Achromobacter* genera proved to be the most strongly oxidizing types; those of the *Alcaligenes* and *Brucella* were somewhat less oxidizing, although still strongly positive; members of the *Aerobacter*, *Escherichia*, and *Proteus* bacilli were weakly positive, variable, or negative; while the cocci and one anaerobic type were definitely oxidase-negative. In general, strong oxidizers were Gram-negative, while those not strong oxidizers were Gram-positive. The significance of the oxidase test in relation to microbial spoilage of dairy products and other foods is discussed at length.

**Effect of lactic acid on the hydrolysis of fat in cream by pure cultures of lipolytic micro-organisms,** E. L. FOUTS. (Okla. A. and M. Col). (*Jour. Dairy Sci., 23 (1940), No. 4, pp. 303–306*).—Samples of sterilized cream to which various amounts of sterilized lactic acid had been added were inoculated with various lipolytic micro-organisms and incubated for 6 days at 21° C. *O[ospora] lactis*, *myc[obacterium] lipolytica*, and *Ach[romobacter] lipolyticum* were definitely inhibited by adding excessive amounts of the acid to cream. However, all grew well in cream containing sufficient acid to give a titratable acidity of 1 percent, and the first two produced lipolysis in cream having an acidity of 2.08 percent. The action of most lipolytic species was inhibited by growth of butter culture organisms in cream, but *M. lipolytica* showed increased growth under these conditions, and all organisms caused a significant amount of lipolysis even in high-acid creams. The acid number of the fat after 6 days at 21° was not significantly affected by the presence of large amounts of lactic acid.

**Relation of volatile acidity of butterfat to rancidity,** E. L. FOUTS. (Okla. A. and M. Col.). (*Jour. Dairy Sci., 23 (1940), No. 4, pp. 307–314*).—Studies of butters varying widely in degree of rancidity revealed no close correlation between the percentages of total acid in the fat that were volatile and the degree of

rancidity. However, the different organisms studied showed considerable variability in percentages of total fat acid that were volatile and nonvolatile, the percentage that was volatile ranging from 1.9 percent with *O[ospora] lactis* to 14.7 percent with *Ps[eudomonas] fluorescens*. The ratio of volatile to nonvolatile acid was quite constant for a given species, regardless of age of culture, incubation temperature, or degree of fat hydrolysis. Synthetic media containing sodium or calcium salts of butyric, caproic, and caprylic acid as the sole source of carbon supported good growth in certain lipolytic organisms, particularly *O. lactis*, but little or no growth in other species.

**Improvement of the Hotis test for the detection of mastitis streptococci,** J. F. Cone and F. M. Grant. (U. S. D. A.). (*Jour. Milk Technol., 3 (1940), No. 2, pp. 75–79*).—A method for the detection of mastitis streptococci consisting essentially of a combination of the Hotis test (E. S. R., 76, p. 391) and the Bryan microscopic examination (E. S. R., 73, p. 103) is described. In the examination of a large number of milk samples this procedure detected 96.8 percent of the samples from quarters infected with streptococci and 99.5 percent of the samples from streptococci-free quarters.

**The deterioration of the bovine udder in the absence of streptococci,** E. G. Hastings and E. H. Peterson. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 3, pp. 145–156*).—Eleven Holstein cows milked by machines were observed during the first, second, and third lactation periods as to kinds and numbers of bacteria present and chlorine and catalase content in the foremilk. The milk yield per quarter was also determined at frequent intervals. In each instance the percentage of chlorine and catalase increased in each lactation period and from period to period. In some cows these changes occurred approximately simultaneously in each quarter and were of a similar magnitude in all four quarters. In other cases the milk produced by the different quarters did not change at the same time or to the same extent, indicating that the causal agent was acting with varying intensities in the different quarters or was absent from some. The udder of each animal remained free from streptococci throughout the three lactation periods, and no other organism was found with sufficient constancy or in sufficient numbers to be responsible for the changes noted in the composition or level of production of milk and in the structure of the udder. The apparent complex nature of the causes of mastitis or of deterioration of the udder and the need for further long-time studies in this field are stressed.

**The use of annatto as a tracer in cream for manufacturing purposes and its detection,** C. W. England and N. E. Yongue. (Md. Expt. Sta.). (*Jour. Dairy Sci., 23 (1940), No. 4, pp. 331–335*).—Repeated tests have demonstrated annatto (vegetable cheese color) to be satisfactory as a tracer for cream intended for manufacturing purposes. The described test for detecting annatto in cream is based on the simultaneous extraction of fat with gasoline and extraction of annatto with alcohol, removal of alcohol serum by centrifuging, absorption of annatto by an alkaline filter, and confirmation with stannous chloride. The test is sensitive to 1 part of annatto in 500,000 parts of cream.

**The density at 140° F. of the materials expressed as fat by various volumetric tests of cream,** P. G. Miller, S. T. Coulter, and W. B. Combs. (Minn. Expt. Sta.). (*Jour. Dairy Sci., 23 (1940), No. 4, pp. 285–288*).—Determinations of the density at 140° of the materials read as fat with various tests of cream gave the following mean values: Filtered butterfat, 0.8917; Mojonnier, 0.8935; Babcock, 0.8951; Minnesota Nafis, 0.8909; Minnesota 202, 0.884; *n*-butyl alcohol, 0.8926; and amyl alcohol, 0.8914. Calculated temperatures at which the density of the fat column would be approximately 0.9 ranged from 72° for the Minnesota 202 test to 127° for the Babcock test.

**Milk energy yield and the correlation between fat percentage and milk yield,** W. L. Gaines. (Ill. Expt. Sta.). (*Jour. Dairy Sci., 23 (1940), No. 4, pp. 337–342, fig. 1*).—The author has attempted to develop an estimate of the expected coefficient of correlation between butterfat percentage and milk yield ($r_{Mf}$) based on the theory that milk yield is inversely proportional to milk energy per unit of milk, or milk-energy yield is independent of milk composition. The equation $-r_{Mf}=\frac{V_f}{V_M}\frac{\bar{f}}{2\frac{2}{3}+\bar{f}}$, where $V$ is variability and $\bar{f}$ is mean fat percentage, has been derived. Stress is laid on "the fact that the correlation between fat percentage and milk yield is low does not detract from its biological significance or warrant its neglect in a practical breeding philosophy."

**Official flavor criticisms of dairy products in the National Contest,** G. M. Trout, W. White, P. A. Downs, M. J. Mack, and E. L. Fouts (*Jour. Dairy Sci., 23 (1940), No. 4, pp. 325–330, figs. 4*).—A further report of this committee (E. S. R., 82, p. 675), which lists the predominating flavor criticisms of butter, cheese, milk, and ice cream used by official contest judges over a period of years.

**Influence of feeds on lecithin content of milk and possible relationship of lecithin content to susceptibility of milk to copper-induced oxidized flavor,** I. A. Gould, W. K. Fox, and G. M. Trout. (Mich. Expt. Sta.). (*Food Res., 5 (1940), No. 2, pp. 131–139, figs. 3*).—Milk samples analyzed in this study were obtained from groups of cows representing four dairy breeds, alternately fed high-fat and low-fat rations, also from animals receiving a corn-alfalfa ration and a balanced ration with and without pasture supplement. The average lecithin content of the milk under the varions feeding regimes was: High-fat ration 0.0474, low-fat ration 0.0461, corn-alfalfa 0.0411, dry feed 0.043, and pasture 0.0445, indicating that feed has little influence on the lecithin content of milk. The average of 198 samples without regard to feed was 0.046 percent. A negative correlation of −0.7406 was found to exist between the percentage of fat in the milk and the percentage of lecithin in the fat, indicating a fairly constant amount of lecithin in the milk irrespective of changes in the fat test. The correlation between percentage of lecithin in milk and percentage of fat in milk was only 0.3693. No relationship was observed between the susceptibility of milk to copper-induced oxidized flavor and the lecithin content.

**Influence of sunlight on flavor and ascorbic acid content of milk exposed in three different types of paper containers,** J. L. Henderson, D. C. Foord, and C. L. Roadhouse. (Univ. Calif.). (*Food Res., 5 (1940), No. 2, pp. 153–159, figs. 2*).—Paper containers fabricated from (1) a thin white bleached paper, (2) a cream-colored paper of intermediate thickness, and (3) a relatively thick paper with the inner plies unbleached and light brown in color, were compared in this study. Milk samples in clear glass bottles and in each of the three types of paper containers were exposed to midday sun for varying periods, placed in cold storage, and scored for flavor at 2 and 20 hr. after exposure. The ascorbic acid content of the samples was also determined. The paper containers, while varying in protective capacity, all exhibited greater protection from the effects of sunlight than clear glass. The thick unbleached paper gave complete protection against flavor defect and nearly complete protection against ascorbic acid destruction during 2 hours' exposure to sunlight. The degree of ascorbic acid destruction proved to be a useful index of the effect of sunlight on milk flavor.

**Reduction of curd tension of milk by the addition of sodium salts,** P. H. Tracy and W. J. Corbett. (Univ. Ill.). (*Jour. Dairy Sci., 23 (1940), No. 4, pp. 289–294*).—Experiments involving the use of sodium citrate, sodium

pyrophosphate, and sodium hexametaphosphate gave evidence that the addition of small amounts of any of these sodium salts to milk resulted in a permanent reduction in the curd tension of the milk. Amounts necessary to reduce the curd tension from approximately 50 to 0–10 gm. were 0.075, 0.15, and 0.2 percent for the hexametaphosphate, pyrophosphate, and citrate, respectively. A lower curd tension resulted when the salts were added after pasteurization to the cooled milk. Normal creaming of the milk was not affected until sufficient salt was added to change the viscosity, and titratable acidity remained practically unchanged. The flavor of milk was somewhat affected by the addition of these salts.

**Influence of neutralizers upon the curd content of butter**, R. C. Townley and I. A. Gould (*Michigan Sta. Quart. Bul., 22 (1940), No. 4, pp. 245, 246*).—Six neutralizers were compared, each being added in amounts sufficient to reduce the acidity of cream containing 35 percent butterfat from approximately 0.5 percent to acidities of 0.25, 0.15, 0.1, 0.05, and 0 percent. It was found that the curd content of the butter was not materially affected by the kind of neutralizer used or by the point of acid reduction except when calcium lime was used to neutralize to a theoretical acidity of approximately 0.15 percent or below, in which cases pronounced increases in the curd content of the butter occurred.

**Use of frozen fruits in ice cream investigated**, A. J. Morris (*Farm and Home Sci.* [*Utah Sta.*], *1 (1940), No. 2, pp. 2, 11, figs. 1*).—Preliminary surveys on consumer acceptance of a wide variety of fruit ice creams indicate the possibility of utilizing significant quantities of frozen fruits in ice cream manufacture.

## VETERINARY MEDICINE

**[Work in animal pathology by the Kentucky Station]** (*Kentucky Sta. Rpt. 1939, pt. 1, pp. 16–21*).—The work of the year reported upon (E. S. R., 81, p. 569) includes a study of paratyphoid bacilli, periodic ophthalmia in horses and the relation of *Brucella* to the disease, virus abortion in mares, incoordination in horses, corynebacteria in domestic animals, listerellosis of sheep, isolation of the causative organism (*Erysipelothrix rhusiopathiae*) of swine erysipelas from pigs, and nutritional deficiency as a direct or contributing factor in the illness or death of animals.

**[Work in animal pathology by the Nevada Station]** (*Nevada Sta. Rpt. 1939, pp. 23, 31–33*).—The work of the year briefly reported upon includes poisonous range plants, particularly *Astragalus speirocarpus* and *Corydalis caseana*, by C. E. Fleming, M. R. Miller, L. R. Vawter, and A. Young; hemorrhagic disease and lymphangitis in cattle and encephalomyelitis in equines, all by E. Records and Vawter; and a study of types of malnutrition, diminished reproductive activity, and lowered resistance to disease in cattle which appear to be due to deficiencies in the content of certain forms of mineral matter in soil, water, and forage, by Records, Vawter, Miller, and V. E. Spencer.

**[Work in animal pathology and parasitology by the Ohio Station]** (*Ohio Sta. Bul. 600 (1939), pp. 53, 54, 55, 56*).—The year's work (E. S. R., 79, p. 679) reported upon includes experiments for controlling gastrointestinal parasites in sheep and tests with crystal violet vaccine for preventing hog cholera.

**[Work in animal pathology by the South Carolina Station]** (*South Carolina Sta. Rpt. 1939, pp. 87, 88, 95, 96*).—The work of the year reported (E. S. R., 81, p. 108) relates to bovine trichomoniasis, by G. W. Anderson and J. P. LaMaster, and fowl paralysis, by Anderson, R. C. Ringrose, and C. L. Morgan.

**[Work in animal pathology and parasitology by the Wyoming Station]** (*Wyoming Sta. Rpt. 1939, pp. 14-16, 21, 22, 23, 24*).—The work of the year briefly referred to (E. S. R., 81, p. 569) includes forage poisoning due to saltpeter; arrowgrass and other plants which are dangerous because of hydrocyanic acid; investigations of the relationship between various plants and minerals (selenium, vanadium, molybdenum, and cobalt) in the soil and the health of domestic animals; poisonous plants, particularly *Salvia lanceolata* and locoweed (*Oxytropis bilocularis* and *O. besseyi*); vaccination for infectious soremouth of sheep and for coryza (roup) in chickens; abortion in ewes; fowl paralysis; coccidiosis of the domestic fowl; and tapeworms of sheep.

**Permanent distemper immunization by vaccine alone, L. F. Whitney** (*Vet. Med., 35 (1940), No. 7, pp. 408-414, figs. 3*).

**The genus Listerella Pirie, J. H. Pirie** (*Science, 91 (1940), No. 2364, p. 383*).—The name *Listeria* is proposed as a substitute for the preoccupied name *Listerella* given in 1927 to a genus of bacteria that has acquired some importance in both human and veterinary pathology.

**The use of oxalated blood for cytological studies, L. B. Sholl.** (Mich. Expt. Sta.). (*North Amer. Vet., 21 (1940), No. 4, pp. 211, 212*).

***Transmission of epidemic influenza virus in mice by contact,* M. D. Eaton** (*Jour. Bact., 39 (1940), No. 3, pp. 229-241*).—It is concluded that intranasal instillation of influenza virus into mice produces a disease which is essentially a virus pneumonia. Normal mice placed in jars with mice infected with epidemic influenza virus will, under certain conditions, contract an infection which is evident as moderate to extensive consolidation of the lungs but which is seldom fatal. The two strains of human influenza virus are more readily transmitted by contact than are the Melbourne and swine strains. The degree of infection of the contact mice is related to the concentration of virus given to the inoculated mice and to the time of contact. External application of virus does not cause demonstrable infection of mice, but ingestion of virus may produce lung lesions in a certain percentage of a group of mice.

**Ticks and disease, with special reference to spotted fever and tularaemia in the eastern States, R. Matheson.** (Cornell Univ.). (*Cornell Vet., 30 (1940), No. 2, pp. 167-177, figs. 6*).—A general discussion of the subject.

**Studies on the intradermal method of vaccination against equine encephalomyelitis, H. W. Schoening, M. S. Shahan, O. L. Osteen, and L. T. Giltner.** (U. S. D. A.). (*Vet. Med., 35 (1940), No. 7, pp. 377-380, figs. 2*).—In the three experiments reported the intradermal injection of guinea pigs with regular, commercially prepared, chick embryo equine encephalomyelitis vaccine produced as good, if not better, immunity than when the same vaccine in the same amounts was injected subcutaneously. Vaccine injected intradermally in various amounts in horses produced a better immunity than the same vaccine in similar amounts when injected subcutaneously. In horses the immunity produced by intradermal injection of vaccine in two 1 cc. doses was as good as that produced by two 10 cc. doses subcutaneously. Vaccines reported to have caused severe, undesirable reactions in horses in the spring of 1940, when injected into 20 horses intradermally, produced very little local reaction, while the same vaccine injected subcutaneously or intramuscularly in 20 horses produced in some of the animals rather marked, extensive swellings at the site of injection. The greater number of these untoward reactions appeared in horses which had been vaccinated in 1939.

**Studies on equine encephalomyelitis in Iowa during 1939, H. E. Biester and L. H. Schwarte** (Iowa State Col. and U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 759, pp. 719-723*).—The authors report that during

the summer of 1939 1 squirrel and 32 horse brains were examined for virus encephalomyelitis in Iowa. "Seventeen, or 53.1 percent, of the horses studied presented histological evidence of virus encephalomyelitis. From 8, or 25 percent, virus of the western type was recovered. Seven histologically positive cases were contaminated. Guinea pigs inoculated with brain tissue from these died within 8 or 10 hr. following injection. Berkefeld filtrates prepared from some of the contaminated brains failed to infect guinea pigs. The 17 histologically positive cases occurred in unvaccinated horses. In 8 unvaccinated horses, no evidence of virus infection was found. A case of mouldy corn poisoning and 1 presenting a teratomatous cyst in the cranial cavity were included in the last-mentioned group. Seven specimens from vaccinated horses were examined, and no evidence of a virus infection was found in them."

**A field experiment in the use of prontosil for the treatment of horse sickness,** W. Rainey (*Jour. So. African Vet. Med. Assoc., 10 (1939), No. 4, pp. 180, 181*).—An outstanding cure of a case of horse sickness by the administration of prontosil is reported.

**A method for preserving Trypanosoma equiperdum,** W. S. Stone and A. T. Thompson (*Science, 91 (1940), No. 2362, p. 344*).—A method by which *T. equiperdum*, the cause of dourine of the horse, has been kept viable and infective for a period of 14 mo. through freezing and storing infected rat blood in a dry ice alcohol bath is described.

**A study of the agglutination titres of milk serum from known infectious abortion reactor cows,** H. D. Pritchett and S. T. Walton (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 759, pp. 709–713, 714*).—The details of studies conducted by the authors are presented in two tables.

**Studies on genetic resistance in swine to Brucella infection: Preliminary report,** H. S. Cameron, E. H. Hughes, and P. W. Gregory. (Univ. Calif.). (*Cornell Vet., 30 (1940), No. 2, pp. 218–222*).—During the course of investigations in California of *Brucella* infection in swine, "two sows were apparently resistant to repeated oral administrations of *B. suis*. These sows were mated to a boar which showed, by the agglutination test, a resistance of a lesser degree. An attempt was made to infect 33 progeny from such matings. As judged by the agglutination test, a high percentage were resistant, while the remainder were divided between the susceptible and the undetermined."

**A report on Bang's disease vaccinated heifers in an infected herd,** A. M. Mills (*Cornell Vet., 30 (1940), No. 2, pp. 195, 196*).

**The proper collection of milk samples for streptococcic mastitis test,** C. S. Bryan and H. H. Ruhland (*Michigan Sta. Quart. Bul., 22 (1940), No. 4, pp. 259–263*).—It is pointed out that milk samples for the microscopic test for streptococcic mastitis should be submitted from lactating cows only, excluding those near the beginning or end of lactation. They should be collected by milking directly into the mastitis vial. The milk sample must include a small quantity of milk from each quarter of the cow if the test result is to indicate the status of the cow. The samples must not be collected within a period of 2 hr. following the regular milking. A description is given of the technic for the proper collection of such milk samples.

**A study of an outbreak of acute swine erysipelas in one herd,** H. W. Schoening, J. E. Peterman, and C. G. Grey. (U. S. D. A.). (*Jour. Amer. Vet. Med Assoc., 96 (1940), No. 759, pp. 714–718, fig. 1*).—Report is made of a field and laboratory investigation of an outbreak of swine erysipelas that occurred on a farm in eastern Nebraska in October 1939.

**Lymphoblastoma in the bovine,** E. R. Frank and W. W. Thompson. (Kans. State Col.). (*North Amer. Vet., 21 (1940), No. 4, pp. 217–221, figs. 6*).

**On the question of the intra-uterine transmission of *Anaplasma centrale*,** K. ENIGK (*Jour. So. African Vet. Med. Assoc., 10 (1939), No. 3, pp. 130, 131*).—From observations on a calf, the author concludes that intrauterine infection of *Anaplasma* and *Theileria mutans* does not take place.

**Efficacy of nonconditioned phenothiazine in removing worms from the alimentary canal of cattle,** L. E. SWANSON, D. A. PORTER, and J. W. CONNELLY. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 759, pp. 704–707*).—In work conducted at the U. S. D. A. Bureau of Dairy Industry laboratory at Moultrie, Ga., "unconditioned phenothiazine removed 100 percent of mature *Haemonchus contortus* and *Trichostrongylus axei* as well as 99.8 percent of *Oesophagostomum radiatum* from calves when the drug was administered in doses varying from 50 to 80 gm. (0.44 to 1.1 gm. per kilogram of body weight). In limited tests unconditioned phenothiazine at a dose rate of 0.44 to 0.55 gm. per kilogram of body weight in calves weighing over 91 kg. (200 lb.) was less effective against hookworms (=*Bunostomum phlebotomum*) than when given to lighter calves at a dose rate of from 0.66 to 1.1 gm. per kilogram of body weight. The chemical was approximately 84 percent effective against *Ostertagia ostertagi*, slightly effective against *Cooperia* spp., and ineffective against *Trichuris* sp., *Strongyloides papillosus* and *Moniezia* sp. A larger percentage of *C. pectinata* than of *C. punctata* was removed by the treatment. Phenothiazine was found to be comparatively nontoxic for calves. This drug shows considerable promise as an anthelmintic for gastrointestinal nematodes in these host animals."

**The anterior pituitary lobe hormones in the treatment of ketosis in the dairy cow,** M. G. FINCHER and C. E. HAYDEN (*Cornell Vet., 30 (1940), No. 2, pp. 197–217*).—In work conducted in New York State, 17 cases in the series led the clinician to suspect "some degree of acetonemia from observed symptoms and through the use of the qualitative test for acetone bodies in the urine of the patient. The quantitative test for acetone bodies in the blood and urine indicates that the major percent of the cases showed varying degrees of acetonemia. Some were marked, some medium, and some slight. In a small percent the acetone body content seemed to be at normal. The anterior lobe hormone preparation was administered to 13 of the cases in the series. Two cases received gonadotropes in the form of gonadin. Of the remaining 2 cases 1 received an anterior pituitary-like preparation, 1 received the anterior pituitary lobe preparation in addition to the anterior pituitary-like preparation. Some of the cases received additional treatment such as glucose, molasses, and chloral. Data are too few to substantiate any claim that these hormone preparations are specific in the treatment of ketosis, but in some cases their use would appear to have had some merit. All helpful treatment is justified in treating highly bred, sensitive, and high-producing cows. In addition to other agents that have been found useful the anterior, pituitary lobe hormones may have a definite place in the treatment of disorders that afflict the dairy cow at or near parturition. A few of our most marked cases recovered with no other therapy."

**Zephiran in the treatment of foot-rot in cattle,** J. W. SCALES. (Va. A. and M. Col.). (*Vet. Med., 35 (1940), No. 6, pp. 335, 336*).—The author has found that Zephiran, a mixture of high molecular alkyl-benzyl-ammonium-chlorides derived from the fatty acids of coconut oil, is an effective antiseptic for treating foot rot in cattle, most cases recovering after one application. It has proved far superior to remedies previously used for this condition and is considered to merit trial in other necrophorus infections.

**Minimum lethal dose of selenium, as sodium selenite, for horses, mules, cattle, and swine,** W. T. MILLER and K. T. WILLIAMS. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 3, pp. 163–173*).—In the course of work con-

ducted in 1934 and 1938 with a view to determining the effect of continued feeding of small doses of selenium in various forms to small experimental animals, in which five horses, three mules, five cattle, and seven swine were used, data were obtained, the details of which are tabulated in part. It was administered orally in the feed, as a drench or by stomach tube, dosage being calculated as milligrams of selenium per pound of body weight. Large doses were given at the beginning of each test, and the quantity was reduced for other animals until the minimum lethal dose was reached. Although all but two of the horses and mules used in the work had been used previously in infectious-disease experiments, they appeared healthy on clinical examination. The minimum lethal dose of selenium was found to be about 1.5 mg. per pound of body weight. In the experiments with cattle, one calf and four cows were included. The calf was 5 days old. Two of the cows were between 3 and 4 yr. of age and the other two were several years older. All appeared healthy clinically and were not known to have been exposed to any infectious disease. The minimum lethal dose for this species was found to be between 4.5 and 5 mg. per pound of body weight. In the experiments with swine, apparently healthy pigs varying in age from 4 to 6 mo. were used. For these animals the minimum lethal dose of selenium was found to be between 6 and 8 mg. per pound of body weight.

**Toxicity to sheep of lead arsenate and lead arsenate spray residues,** J. L. St. John, E. C. McCulloch, J. Sotola, and E. N. Todhunter. (Wash. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *60* (*1940*), *No. 5, pp. 317–329*).—Occasional reports received by the station of the illness or death of livestock, principally cattle and sheep, that had been pastured in sprayed orchards during the fall led to the experiments here reported, the details of which are given in five tables. In the course of the work nine sheep were fed lead arsenate orally in capsules in amounts varying from 0.25 to 2 gm. per day. Animals receiving 1 and 2 gm. per day died within a few days, in most cases after having received about 1.5 gm. of arsenic (2 gm. $As_2O_3$). One animal receiving 0.25 gm. of lead arsenate per day survived 35 days and another continued to live after receiving this amount for 94 days and was in good condition at the end of 10 mo. About 1.5 gm. of arsenic in the form of lead arsenate appears to be approximately a lethal dose when fed in small amounts daily. This is equivalent to about 41 mg. of arsenic (As) or 192 mg. of lead arsenate per kilogram of body weight. Analytical results of stomach contents, a number of organs, and on urine and feces did not account for all lead and arsenic consumed. A larger proportion of the lead and arsenic remaining in the body was found in the stomach contents. Inclusion of apples in the ration had no apparent effect on the toxicity or elimination of lead and arsenic. Small amounts of these elements were found in the liver, kidney, heart, lungs, gall bladder, bones and marrow, and wool.

**Tuberculosis in sheep,** E. L. Stubbs (*Jour. Bact.*, *39* (*1940*), *No. 3, p. 339*).—A brief report is made of a case of ovine tuberculosis, a rare disease in the sheep, that was found due to the bovine type of the tubercle bacillus, in which the organism was pathogenic for the chicken, which is of uncommon occurrence. It is stated that most of the cases of tuberculosis in the sheep thus far typed have been due to the avian form of the organism.

**Poisoning in sheep and goats by sacahuiste (Nolina texana) buds and blooms,** F. P. Mathews. (Coop. U. S. D. A.). (*Texas Sta. Bul. 585* (*1940*), *pp. 19, figs. 4*).—Report is made of poisoning of sheep, goats, and cattle from feeding on the buds and blooms of a plant (*N. texana*) relatively common on the ranges of western Texas. When these parts are consumed by sheep and goats in amounts greater than 1 percent of their body weight the animals become sick and usually die. If only dry feed is available at this time they will be very much depressed and icteric due to a marked degeneration of the

liver cells and by obstruction of the bile ducts. If some green feed is consumed at the same time, then, in addition, the animals will become photosensitive and if they are exposed to the sun will develop itching of the skin and marked swelling of the skin and subcutaneous tissue of the head, including the ears. Losses from this source may be prevented by removing the animals from infested pasture during the blooming season or by concentrating them on a smaller area in the pasture or removing them to less heavily infested areas so that they will not be able to consume a toxic dose during a day's grazing.

**Coccidia and coccidiosis in feeder lambs,** A. W. Deem and F. Thorp, Jr. (Colo. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 759, pp. 733–735*).—Further studies of the various factors influencing coccidiosis in Colorado (E. S. R., 80, p. 826), carried on during 1938–39, are reported, the details being given in table form. Fecal examinations from individual lambs show, in general, a marked increase in the numbers of coccidia during the first month in the feed lot, then the number declines, either rapidly or gradually, for 2 or 3 mo., after which few coccidia can be found. Some evidence is presented which indicates that the ration fed is a factor in the cause of clinical coccidiosis and has a definite influence on the mortality.

**Failure of dietary magnesium imbalance to produce urinary calculi in wethers,** D. W. Johnson, L. S. Palmer, and J. W. Nelson. (Minn. Expt. Sta.). (*Vet. Med., 35 (1940), No. 6, pp. 353–357, fig. 1*).—The loss of ±10 percent of a flock of 2,600 wether lambs from urinary calculi over a period of about 6 weeks led to these studies. Analyses of stones from a lamb that had the disease and of the ration fed the lambs suggested that the high magnesium content of the ration was the cause of the trouble. Of 20 lambs from the flock used in the study, one-half were fed a ration the dry matter of which contained 1.5 percent of magnesium. "The remaining lambs received the same ration plus sufficient limestone to give a calcium content of 5.1 percent. The rations were fed for 154 days. Urine specimens for pH determinations and observations as to crystal formation and blood samples for calcium, magnesium, and inorganic phosphorus analyses were obtained before the start of the experiment and at intervals thereafter. There was a threefold increase in the blood magnesium of both groups of sheep as the result of feeding the experimental rations. In spite of this increase, which apparently was responsible for crystal formation in the urine of a few of the lambs, calculi were not produced."

**Listerella encephalitis (circling disease) of sheep, cattle, and goats,** P. Olafson (*Cornell Vet., 30 (1940), No. 2, pp. 141–150, figs. 6*).—This summary of information on an acute specific, infectious encephalitis of sheep, cattle, and goats caused by a short, Gram-positive bacterium of the genus *Listerella* includes a history of the disease in New York State and the results of some experimental studies.

**Effect of commercial phenothiazine on a heavily-parasitized ram,** R. T. Habermann and W. H. Hunt. (U. S. D. A.). (*Vet. Med., 35 (1940), No. 5, pp. 298–300, figs. 3*).—In the studies reported, 25 gm. of commercial phenothiazine was very effective in removing the nematodes from the gastrointestinal tract of a sick, heavily parasitized ram. The percentage of red blood cells and the weight of the ram increased rapidly after the nematodes were removed. Photographs taken before and after treatment, and here reproduced, show the marked improvement in the ram's general condition.

**Anaplasmosis-like disease of swine,** R. Spencer. (Kansas State Col.). (*Vet. Med., 35 (1940), No. 5, pp. 294, 295*).—It is concluded from observations by the author and by others that the anaplasmosislike disease of swine reported several times during the last 10 yr. is an acute disease of young pigs consisting

of an ictero-anemia with hepatic degeneration and splenic enlargement, probably caused by the *Anaplasma* or *Rickettsia* bodies found in the erythrocytes.

**The enteritis syndrome in swine,** L. P. DOYLE. (Purdue Univ.). (*North Amer. Vet., 21 (1940), No. 4, pp. 213–216, fig. 1*).

**Icterus in a garbage-fed hog due to a foreign body,** G. C. HOLM. (Idaho Expt. Sta.). (*Vet. Med., 35 (1940), No. 6, p. 363, fig. 1*).

**Differentiation of viruses of canine distemper and fox encephalitis,** R. G. GREEN (*Vet. Med., 35 (1940), No. 6, p. 365*).—A brief description is given of canine distemper and fox encephalitis and their differentiation.

**Methods of diagnosis and treatment of the intestinal parasites of small animals,** R. E. REBRASSIER. (Ohio State Univ.). (*Cornell Vet., 30 (1940), No. 2, pp. 133–140, figs. 5*).

**An inquiry into the influence of environment on the incidence of poultry diseases,** L. VAN ES and J. F. OLNEY (*Nebraska Sta. Res. Bul. 118 (1940), pp. 57, figs. 15*).—An investigation aimed at the evaluation of hygienic measures and the gathering of available data pertaining to the relation of certain disorders to a given fowl population after its exposure to their specific etiologic factors is reported, the details being given in 34 tables.

"An experimental attempt to determine whether or not healthy, nonreacting fowls exposed to others affected with bacillary white diarrhea would acquire positive blood titers by environmental contact yielded negative results. The sanitary restrictions adopted afforded a manifestly favorable influence on morbidity in the face of a fowl typhus hazard present in an environment occupied by the flocks concerned. Although some evidence of the environmental transmission of fowl cholera was encountered, it appears that the character of a given environment exercises no manifest influence. The benefits of sanitary restrictions are apparently canceled by the intensity and virulence of direct contact infection. In the transmission and dissemination of fowl cholera, apparently healthy birds, as infection carriers, play a dominant part. A given environment may be either reasonably sanitary or the very opposite without greatly modifying the incidence of avian tuberculosis after tuberculous fowls have been introduced. Healthy, older fowls showed a rather well marked resistance to avian tuberculosis when exposed by direct and indirect contacts in an environment in which the opportunities for doing so were ample. In the evaluation of sanitary measures in connection with coccidiosis of chicks, mortality alone cannot be accepted as a final criterion. The determination of coccidial infestation proved to be a more dependable criterion by which to judge the sanitary fitness of a given environment. By the use of hardware cloth panels combined with adequate protection of the food and water supply against fecal contamination, it was possible to reduce the incidence of coccidiosis to a bearable minimum. Turkey poults were raised to maturity with a minimum blackhead hazard when maintained in an environment covered by coarse gravel, when food and water were provided in sanitary utensils, and when contacts with common fowls were avoided. Turkey poults may be raised to maturity in a restricted area covered by hardware cloth panels without a blackhead risk even after the poults affected with the disease are introduced among them. Poults maintained under a rather intense exposure to blackhead from 1 to 4 weeks may, to a considerable extent, find sanctuary when transferred to an environment where sanitary restrictions prevail. The common fowl and its body wastes must be regarded as the fountainhead of blackhead infection. The blackhead hazard was still present in soil 2 yr. after common fowls were removed from the lot concerned. In an insalubrious environment, exclusively occupied by turkeys during 6 mo. of each year, blackhead morbidity progres-

sively declined in the course of 7 yr., until a temporary occupancy by fowls of the lot concerned caused morbidity to exhibit an upward trend."

**Relationship of ruptured yolk to fowl paralysis,** E. N. MOORE. (W. Va. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 759, pp. 727–732*).—Ruptured yolk does not represent a separate disease entity. In a flock of 500 birds studied the mortality for the 10 pens the first 9 mo. was 20.8 percent. "The losses from fowl paralysis or fowl paralysis associated with ruptured yolk accounted for 11.2 percent of the deaths. Seven percent were due to fowl paralysis, and 4.2 percent showed the two conditions present in the same bird. Only 1.8 percent of the birds showed ruptured yolk alone. By chance we could expect 11 birds to show the two conditions in the same individual (after deducting those birds with fowl paralysis and without ruptured yolk which did not lay for 3 or more weeks prior to autopsy). Actually, there were double the number we could expect by chance if they were independent of each other."

**Coccidiosis of domesticated birds, with special reference to the common fowl,** E. R. BECKER. (Iowa State Col.). (*Vet. Med., 35 (1940), No. 7, pp. 401–407, figs. 2*).

**The significance of biological types of Salmonella typhi-murium (Salmonella aertrycke),** P. R. EDWARDS and D. W. BRUNER (*Kentucky Sta. Bul. 400 (1940), pp. 41–70*).—Studies of the biological characteristics of types of *S. typhimurium* and the zoological distribution of such types are reported, the details being given in six tables. The biochemical and serological tests employed have shown this organism to be divisible into a number of types. "The types established are epizootically significant, and all the cultures from a single outbreak of the infection belong to the same type. The non-rhamnose-fermenting strains which certain European workers have associated with ducks are not prevalent in ducks in the United States. They occur rarely and were found in turkeys and a pheasant. The 'ammonia-weak' strains which Hohn and Herrmann have associated with pigeons are found only occasionally in pigeons in the United States. They occur rarely in other animal species. Practically all cultures isolated from pigeons in the United States lack antigen V of the Kauffmann-White schema. It is suggested that the lack of this antigen in a culture indicates that the outbreak of infection from which it was derived was directly or indirectly connected with infection of pigeons."

**The transmission of and resistance to fowl paralysis (lymphomatosis),** E. M. GILDOW, J. K. WILLIAMS, and C. E. LAMPMAN (*Idaho Sta. Bul. 235 (1940), pp. 22, figs. 6*).—In the experiments reported fowl paralysis was found to be readily transmissible to young chicks by contact. Chicks from susceptible stock contracted the disease regardless of attempts to isolate them on the premises where paralysis-affected stock existed. Pullets from paralysis-susceptible stock showed a distinct age resistance when not introduced before 6 weeks of age to premises now or recently occupied by affected stock. Definite evidence is presented that certain families are more resistant than others to the disease. A high degree of resistance to fowl paralysis has been developed through intensive selection. The progeny of hens was shown to be more resistant to the disease than the progeny of pullets in the same affected flock. Confined rearing did not reduce the occurrence of the disease below that attained by range rearing. The details of the work are given in five tables.

**Fowl typhoid,** L. D. BUSHNELL. (Kans. Expt. Sta.). (*Vet. Med., 35 (1940), No. 5, pp. 313–315, fig. 1*).

**A method of raising turkeys in confinement to prevent parasitic diseases,** E. P. JOHNSON (*Game Breeder & Sportsman, 45 (1940), Nos. 4, pp. 50–52, 62, fig. 1; 5, pp. 68, 78, 79*).—The data here presented have been noted from another source (E. S. R., 82, p. 827).

## AGRICULTURAL ENGINEERING

**[Agricultural engineering investigations by the Nevada Station].** (Partly coop. U. S. D. A. and Univ. Nev.). (*Nevada Sta. Rpt. 1939, pp. 33–35*).—These have included work of the department of irrigation, by G. Hardman and H. G. Mason, on an inventory and history of the agricultural land resources of the basins of the Truckee, Carson, and Humboldt Rivers and minor streams, reported under the subheads cooperation with Elko County range conservation study and land-classification maps, and on an inventory and history of the water resources of these basins, reported under the subheads tree-ring studies and studies of variation in lake level.

**[Agricultural engineering investigations at the Ohio Station)** (*Ohio Sta. Bul. 600 (1939), pp. 64–66, figs. 3*).—Report is made on experiments with various wheats, in which it was found that sagging of grain heads due to weak straw causes heavy cutter-bar losses, and ready breaking up of straw by the cylinder causes much rack and shoe loss, the sagging being worse than the straw breakage; and on corncrib pressures, which were found to be greatly increased by expansion of previously dry corn during the damp weather of late spring.

**[Agricultural engineering investigations of the South Carolina Station]** (*South Carolina Sta. Rpt. 1939, pp. 54–60, 104, 105*).—Use of electrically heated beds in sweetpotato plant production is reported upon by J. B. Edmond and G. H. Dunkelberg under the captions influence of type of cover, insulation of frames, horizontal spacing of heating cable, position of heating cable, high and low soil temperatures, and "crowded" and regular bedding of roots. Temporary v. permanent silos are discussed by E. D. Kyzer and J. E. Love.

**Putting down and developing wells for irrigation,** C. ROHWER (*U. S. Dept. Agr. Cir. 546 (1940), pp. 86, figs. 41*).—It is pointed out in a brief introduction that for irrigation, as distinct from domestic supply, wells capable of supplying large quantities of water at a reasonable cost are required. This circular is intended for the information of farmers, well drillers, and others concerned with the construction of pumping plants for irrigation.

The principal phases of the subject here dealt with are factors affecting the feasibility of pumping plants, including legal status of pumping from wells, water supply, pumping lift, and well contract; factors affecting flow of ground water into wells; hydraulics of wells, under which heading are given formulas for the approximate computation of the discharge in gallons per day of the artesian and nonartesian types; battery wells; interference of wells; test-hole drilling by the sand-bucket, standard-tool, hydraulic-rotary, jetting, hollow-rod or self-cleaning, and auger methods; irrigation wells and their construction by various methods; gravel-envelope or gravel-screen wells; development of wells by pumping, by surging, with air, by backwashing, and with solid carbon dioxide; testing wells; and the cost of constructing wells in 12 western States.

**Irrigation and drainage research,** O. W. ISRAELSEN (*Farm and Home Sci. [Utah Sta.], 1 (1940), No. 2, p. 8, fig. 1*).—This is a popular summary of the objectives of the irrigation and drainage research of the station. Under the primary objective of the more efficient and economical utilization and control of the State's water resources are listed 10 secondary objectives constituting essential phases of the solution of the primary problem.

**Series of factors involved in study of erosion control,** T. N. JONES (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 4, p. 7*).—Factors emphasized as of special importance in farm water disposal are (1) soil type and slope, (2) cropping system, (3) terraces, (4) terrace outlets, (5) woods, (6) ponds, etc. Effects of interplanting *Crotalaria* species with corn on 2.5, 5, 7.5, 10, and 12.5 percent

slopes are shown in terms of the losses resulting from a rainfall of 2.74 in. during 2.5 hr. The crotalaria had reached a height of 6 in. at the time of the storm. It lessened the losses of soil very markedly as compared with those from the plats under corn alone.

**Wind erosion and sand dune control: A selected list of references,** R. W. Moats (*U. S. Dept. Agr., Soil Conserv. Serv. Bibliog. 1 (1940), pp. II+66*).

**Contour farming for soil and water conservation,** C. H. Van Vlack and L. E. Clapp (*Iowa Sta. Bul. P11, n. ser. (1940), pp. 321–335, figs. 17*).—Reports from farmers were found to indicate that contour farming lessened power consumption, whereas on terraced fields about an equal number reported increases and decreases in tractor fuel used. The power saving effected by contouring was generally considered to offset any increase in the time required, as compared with cultivation up and down the slope. The soil conserving value of the contour-cropping system is pointed out, and contour cropping is preferred to terracing, because of the greater cost and less convenience of tillage operations on terraced lands, except in the management of lands which must be used for crops and are so subject to erosion that adequate control can only be obtained by terracing.

A simple type of level, practical for contour lay-out work, has its line of sight across the tops of two liquid columns which are interconnected and so must always be at the same level. A simply constructed "walking A" for laying out contour lines is also described, and its construction is shown in a dimensioned drawing.

**Land-saving plans for conservation in the Pacific Southwest** (*U. S. Dept. Agr., Soil Conserv. Serv., 1939, Region 10, pp. 24, figs. 23*).—Illustrations and brief accompanying statements indicate the nature of and damage done by sheet erosion and gullying and the means of preventing or checking it. Irrigation water as an erosive agent is mentioned.

**Mechanized dusting equipment for pea weevil control,** E. N. Humphrey. (Coop. U. S. D. A.). (*Idaho Sta. Bul. 234 (1940), pp. 11, figs. 28*).—From a study of the effectiveness, cost of operation, and other factors involved in the use of 13 machines operating under commercial conditions, it was found that no material difference resulted in the use of low- and high-pressure machines, nozzle velocities varied greatly with little appreciable difference in effectiveness, and blower power requirements ranged from 1.5 to 8 hp., depending upon the type of blower and accompanying mechanism.

Dusters were mounted on 2- or 4-wheel carts pulled by team or trailed behind a truck or tractor, or were mounted on wheel tractors, crawler tractors, or trucks. They were driven by power take-offs from the tractors or by auxiliary motors. Distribution nozzles and pipes were carried on long booms, varying from 30 to 60 ft. The outer ends of the booms were supported on caster wheels or suspended from a boom tower. Use of the caster wheel required one less man for operation and maintained the hood at a fixed height above the pea vines. Each machine protected an average of approximately 1,093 acres by dusting from one-third to one-fourth of each field. The most satisfactory method of transportation on steep or hilly ground was the crawler tractor.

Cost for operation varied from 21 to 38 ct. per acre. Twenty lb. of dust, the minimum applied, cost $1.50 per acre. The cost of custom dusting averaged 50 ct. per acre for machine operation.

Actual field damage from the use of dusting equipment varied from 1.99 to 3.5 percent. The greatest amount of damage was done by horse-drawn equipment for wide-tread crawler tractors.

**Rubber-tiring farm machines,** D. K. Strothers and A. H. Bennett (*Iowa Sta. Bul. P9, n. ser. (1940), pp. 273–287, figs. 18*).—In a brief statement concern-

ing the advantages of rubber tires over steel wheels for farm machines, this bulletin notes an experiment in which at 2.5 miles per hour a steel-wheeled machine received approximately 6 times as many shocks in passing over 5 miles of graveled road as did a rubber-tired machine of the same model. With the steel wheels there were 4,431 shocks ranging from 350 to 1,988 lb. force, while the rubber-tired machine received only 709 shocks ranging from 350 to 1,288 lb. force. At 5 miles per hour the rubber-tired machine received only 528 shocks compared with 18,261 for the steel-wheeled machine, or 34.5 times as many. The shocks ranged from 1,050 to 3,425 lb. force for each machine. Two manure spreaders of the same model were used in this experiment.

A method for cutting out the hub and spokes of steel wheels and welding them into drop-center rims is described. Each stage of this operation is illustrated by a photograph.

**Adjusting corn planters and listers for sorghums,** L. W. Hurlbut (*Nebraska Sta. Cir. 64 (1940), pp. 14, figs. 10*).—Directions for determining the number and size of holes to be drilled in a blank seed plate for proper seeding of sorghums with a corn planter or lister previously used for corn are given. This procedure is recommended in preference to adjusting the seeding rate and spacing of a corn seed plate because it was found that corn plates tend to produce a seeding rate of from two to three times the recommended weight of seed per acre. If a corn plate is used, some device for spreading the seed along the row should be added because of the larger number of sorghum seed dropped from each cell. The spacing, drilling, and reaming of the holes for a sorghum plate is fully dealt with, the shaping of reamers from sections of a three-cornered file being included. Checking for seed box leakage, causes of cracking of seed, and calibration of the seeding mechanism are also taken up.

**The relation of wall construction to moisture accumulation in fill-type insulation,** H. J. Barre (*Iowa Sta. Res. Bul. 271 (1940), pp. 509–569, figs. 24*).—The permeability of numerous wall construction materials with respect to water vapor was determined, measurements being so made as to simulate conditions under which building materials are used. Materials found to be of high permeability are rosin sheathing paper and fiber insulation boards which are not vapor proofed. Those shown to be of low permeability are heavy asphalt saturated felts and sisal kraft papers. Aluminum paint, applied in two coats, served as a good vapor seal. Other building materials, including plaster, wood, and concrete, were found permeable to water vapor.

Thirty-three test walls, including frame, brick veneer, double tile, and concrete L-block walls, and uninsulated as well as insulated walls, were subjected to controlled conditions of temperature and humidity. A number of the walls were constructed to give wide variation in the water-vapor permeability properties of both the warm and cold sides of the wall to determine the effect of these properties on moisture accumulation. A constant temperature-humidity room was constructed to control the conditions on the warm side of the walls, and mechanical refrigeration was used to maintain low temperatures on the cold side. The conditions maintained were 75° F. and 50 percent relative humidity on the warm side, and a temperature of from 12° to 16° and a r. h. of 80 percent on the cold side. The period of test for different walls varied from 25 to 72 days. At the end of the test period, moisture samples of the insulation were taken, and the inside of the cold side of the wall inspected for free moisture. The frame walls were weighed at intervals throughout the test to observe the rate of moisture accumlation.

In general, the results of the tests on the wall sections also show that to prevent accumulation the permeability of the cold side of the wall must be many

times that of the warm side. A water-vapor barrier in the form of two coats of aluminum paint on the inside surface of the wall reduced the rate of accumulation but did not eliminate it. A similar result was obtained with a wall which had a cold face of high permeability. Uninsulated walls accumulated moisture as well as insulated walls. The accumulated moisture was always found on the inside of the cold wall.

## AGRICULTURAL ECONOMICS

**[Investigations in agricultural economics by the Kentucky Station, 1939]** (*Kentucky Sta. Rpt. 1939, pt. 1, pp. 5–8, 40–42*).—General findings are reported on (1) the factors affecting receipts, profits, etc., from farming in the outer bluegrass area, based on a detailed analysis of 127 farms for the year 1938; (2) systems of farming in the inner bluegrass region; (3) factors affecting profits of farming in type-of-farming area No. 5 of the State, based on records from 92 farms in the Pennroyal Plains section of Sampson, Logan, Todd, Christian, and Caldwell Counties; and (4) costs and returns from lamb and wool production, based on records of 99 flocks in the inner bluegrass region and in Owen, Grant, Meade, and Larue Counties, and of beef cattle based on records from 29 herds in Union, Todd, Christian, and Logan Counties.

The changes in the seasonal movements of Burley tobacco prices and sales and factors contributing to the changes are described.

**[Investigations in rural economics by the Ohio Station, 1937–38]** (*Ohio Sta. Bul. 600 (1939), pp. 60–63*).—Brief general findings are reported on studies of (1) agricultural conservation program in Licking County and six surrounding counties, (2) milk marketing in five areas where farmers were selling whole milk for city consumption or for manufacture, (3) transportation cost in marketing livestock at the Cleveland, Columbus, and Cincinnati markets, and (4) State legislation dealing with agriculture.

**[Investigations in agricultural economics at the South Carolina Station, 1938–39].** (Partly coop. U. S. D. A. et al.). *South Carolina Sta. Rpt. 1939, pp. 9–22, figs. 3*).—Results of investigations not previously noted are included as follows: (1) Chart, by H. A. White, showing the percentage distribution of staple lengths of cotton produced in South Carolina in the crop years 1928–38; (2) findings, by E. Riley, as to farm real estate tax delinquency in the State with chart showing the average percentages 1932–37 of total delinquent properties and of total delinquent taxes by amount of annual delinquency, and table showing total farm real estate taxes becoming delinquent in 1932–37, amount paid as of January 1, 1939, and amount and percentage of total unpaid January 1, 1939; (3) findings, by G. H. Aull and Riley, in a study of the relation of sale price to assessed value of farm real estate with table showing for 30,814 transfers 1900–1937 the total sale price and assessed value per property and per acre grouped by sale value and the relation of assessed to sale price; (4) findings, by W. T. Ferrier, in a study of the cost of farm credit obtained from production credit associations and commercial banks; and (5) findings, by Aull, of the trend of industry in the State with table showing for 1909 and 1937 the number of establishments and wage earners, wages paid, value of products, and value added by manufacture, and chart showing fluctuations in manufacturing activities from 1925 to 1937 as shown by the United States census.

**[Investigations in agricultural economics by the Wyoming Station, 1938–39]** (*Wyoming Sta. Rpt. 1939, pp. 8–10*).—Data are included on the distribution of gross receipts, production, percentage of butterfat, uses made of milk, gross returns per cow, etc., on 198 farms in Lincoln County in 1938; on the

effect of acreage of wheat on returns on 151 dry farms in the northeastern part of the State; and on the value of lands for grazing and dry farm wheat production.

**International yearbook of agricultural legislation, 1939** [trans. title] (*Inst. Internatl. Agr. [Roma], Ann. Internatl. Lég. Agr., 29 (1939), pp. XLVII+965*).—This is a continuation of the series (E. S. R., 82, p. 124).

**Forces causing dairy farmers to make changes in their farm organizations in Barron County, Wisconsin,** R. P. CHRISTENSEN. (Coop. Wis. Expt. Sta.). (*U. S. Dept. Agr., Bur. Agr. Econ., 1939, pp. [4]+70, fig. 1*)—This is a study of some of the problems of interregional competition in dairying. The milk responses between 1928–29 and 1937–38 as shown by accounting records and case studies of 21 farms are analyzed.

**An economic study of the baby beef enterprise in southern Iowa,** J. A. HOPKINS, W. D. GOODSELL, and R. K. BUCK (*Iowa Sta. Res. Bul. 272 (1940), pp. 573–620, figs. 3*).—This bulletin is based on farm records covering the period March 1932 to December 1934 and certain supplementary and more recent data. Part 1 discusses the methods and costs in the beef enterprise and part 2 the relation of the enterprise to the farm as a whole.

Ability of operator seems to be more important than type of land in determining the number of cattle carried and the cost of raising calves. Regardless of topography and percentage of land in crops, the average size of herd was 10 cows per 100 acres. Farms with a large number of spring calves obtained a 9 percent greater calf crop, and the cost of raising calves per 100 lb. was 33 percent less. The cost per 100 lb. of calf varied little between the breeding herds fed and not fed silage. No significant differences were found in rate of gain or cost of gain between lots of fattening cattle fed and not fed silage or those receiving the least and most protein. Labor requirements were generally less per head for the larger herds. Except in years of abnormal conditions, the average farmer could raise feeder calves about as cheaply as they could be purchased. Generally the roughest farms were used for raising beef calves and the smoothest for commercial feeding. Except on commercial feeding farms, 40–60 percent of the corn produced was fed to hogs, and the income from hogs was about equal to that from cattle. On baby beef farms about one-third of the gross income was from cattle, one-third from hogs, 15 percent from dairy products, sheep, and poultry, and the balance from miscellaneous sources.

**A study of legume-grass silage on Ohio farms,** F. L. MORISON (*Ohio State Univ., Dept. Rural Econ. Mimeog. Bul. 127 (1940), pp. [2]+25*).—Data were obtained from 120 farms making legume or grass silage in 1939. The farm management problems, methods, labor requirements, costs, cost of silage as compared with other feeds, etc., are discussed.

The average silage yields per acre were alfalfa 5 tons, soybeans 7.5, and corn 9 tons, and the estimated costs per ton of producing silage were alfalfa $2.69, soybeans $3.91, and corn $3.14.

**Irrigation interval control as an aid in lowering production costs,** J. A. SWEZEY and H. A. WADSWORTH (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 44 (1940), No. 1, pp. 49–68, pls. 3, figs. 10*).—A 20-acre field of sugarcane was laid out into 30 plats, approximately ⅔ acre in size, in block arrangement suitable for interpretation of results by analysis of variance. Part of the plats were irrigated so as to provide 8 days (average 10.9) growth between irrigations, part to provide 4 days (average 4.2), and part no days (average 0.2). Observations were made as to soil moisture, cane growth, etc., and records kept as to number of days of labor, amount of water used, rainfall, etc. The yields of sugar per acre were the same on the plats with 10.9 and 0.2 days between irrigations. The results for the two sets of plats per ton of sugar were, respectively: Man-days irrigating 1.08 and 1.79, million gallons of water used 0.52 and 0.86, cost of labor

($2 per man-day) $2.06 and $3.58, cost of water ($12 per million gallons) $6.24 and $10.32, and total cost of irrigating $8.30 and $13.90.

**North Dakota farm prices,** W. L. Ettesvold (*North Dakota Sta. Bimo. Bul., 2 (1940), No. 5, pp. 7, 8*).—This article continues the series (E. S. R., 83, p. 267). The average farm prices of the 14 products, and indexes and ratios of North Dakota agriculture are given for March and April 1940 and comparisons made with 1939 and the averages 1910–14.

**Factors affecting farm profits in Area 3, West Tennessee,** C. E. Allred, B. D. Raskopf, P. T. Sant, and B. H. Luebke (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 107 (1940), pp. [1]+III+33, figs. 11*).—"This report is based on a farm management and soil conservation survey of profitable farm combinations on 150 farms in Crockett County in 1935, and analysis of the records of 208 successful farms in 7 counties of Area 3, West Tennessee, in 1934." The labor incomes on the 10 farms in each county with the highest income ranged from $673 to $1,955 and those on the 10 farms in each county with the lowest income from —$230 to $96. For the two groups of farms the years required for total receipts to equal investment were from 3.1 to 3.9 and from 5.9 to 7.7, size of farm from 105 to 390 acres and from 64 to 314 acres, acres in cotton from 19.3 to 69 and from 7.6 to 35, acres in corn from 19.2 to 77 and from 9.4 to 35, pounds of lint cotton per acre from 235 to 384 and from 169 to 310, bushels of corn per acre from 15 to 40 and from 14 to 22, and livestock receipts from $221 to $1,090 and from $138 to $436.

**Regional prices received for farm products in Tennessee and United States,** C. E. Allred, B. D. Raskopf, and P. T. Sant (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 110 (1940), pp. V+48, figs. 29*).—Tables and charts are included and discussed summarizing the percentages that prices in different sections of the State of corn, small grains, cowpeas, soybeans, peanuts, tobacco, potatoes, apples, peaches, strawberries, livestock, wool, dairy products, chickens, and eggs are of the highest and lowest State prices and that the Tennessee prices are of the United States average prices.

**Regional prices paid by Tennessee farmers for foods,** C. E. Allred, B. H. Luebke, and W. S. Crawford (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 108 (1940), pp. [1]+III+20, figs. 23*).—This preliminary report includes tables and charts showing by regions and for the State the average prices 1935–38 paid by farmers for sugar, flour, rice, pork (fresh), bacon (smoked), lard, beef (fresh), butter, cheese (American), apples, oranges (216's), lemons (360's), bananas, coffee, and raisins. Some of the factors causing regional variations in prices are discussed.

**Agricultural relief measures relating to the raising of farm prices—74th Congress, January 3, 1935 to June 20, 1936,** M. E. Wheeler (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 84 (1940), pp. VI+75*).—This is the fifth bibliography in the series previously noted (E. S. R., 81, p. 131). The bills are classified under the major agricultural relief plans considered by the Seventy-fourth Congress. Extracts from the Congressional hearings on the bills are included. Bills to raise prices through the national monetary or banking systems, with one exception, are omitted. An author and subject index and a numerical index to the bills and resolutions are included.

**Considering farm adjustments in Subarea 33, Type of Farming Area VII, Montana,** N. W. Johnson. (Coop. Mont. Expt. Sta. et al.). (*U. S. Dept. Agr., Bur. Agr. Econ., 1939, pp. [6]+34, figs. 13*).—A continuation and more detailed study of the subarea included in the previous study (E. S. R., 81, p. 586). It illustrates the relationships "in place" that can be made over most of the plains area of Montana. It deals chiefly with farms having long-time gross income expectancies of $1,000 or less under present organization.

**Corn Belt Conference on Land Tenure, Davenport, Iowa** (*Chicago: Com. Corn Belt Land Tenure, 1939, pp. [2]+63*).—This is a report of the conference held at Davenport, Iowa, June 2–3, 1939. It includes reports of the committees on fundamental principles of land tenure, suggested research, and future meetings and plans, and reports on land tenure research in the different States in the Corn Belt and in the U. S. D. A. Bureau of Agricultural Economics.

**West South Central Conference on Land Tenure, Texarkana** (*Texarkana: W. So. Cent. Conf. Land Tenure, 1939, pp. [2]+28+6*).—This report of the conference at Texarkana December 6–7, 1939, includes reports on the farm tenancy and land tenure research in Arkansas, Louisiana, Mississippi, Oklahoma, and Texas.

**Farm tenancy in the United States, 1937–1939: A selected list of references,** J. M. McNeill (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 85 (1940), pp. VI+160*).—This bibliography supplements a similar one for 1918–36 (E. S. R., 77, p. 713), and includes 433 references to books, pamphlets, and periodical articles on farm tenancy, leases, leasing systems, and the southern sharecropping system published during the period 1937–39, together with a few references to publications issued in 1935, 1936, and 1940. It is divided into three sections—general references relating to the United States as a whole, and references arranged by geographical divisions and by States. An author and subject index is appended.

**Legal aspects of farm tenancy in Illinois,** H. W. Hannah and J. Ackerman (*Illinois Sta. Bul. 465 (1940), pp. 237–276*).—The constitutionality of farm-tenancy legislation in Illinois, the existing statutes, and landlord-tenant relationships under common law are discussed and summarized and suggestions made for a farm-tenancy code for the State.

**Hill land and people in Ross County, Ohio: A study of selected areas,** H. R. Moore. (Coop. U. S. D. A.). (*Ohio State Univ., Dept. Rural Econ. Mimeog. Bul. 125 (1940), pp. [3]+44, fig. 1*).—This is a study of the economic and social factors related to land use in five selected areas of the county representative of different combinations of physical resources, economic development, and social conditions. The present land use and agricultural production, potential land use, land classification by slope, tenure, condition of buildings, water supply, dependence on land, population, occupational pattern, attitude toward governmental activities, etc., are discussed for each area.

**Some of the economic effects of soil conservation in the Salt Creek Watershed, Zanesville, Ohio, 1934–38,** R. H. Blosser. (Coop. U. S. D. A.). (*Ohio State Univ., Dept. Rural Econ. Mimeog. Bul. 124 (1940), pp. [2]+30, fig. 1*).—An analysis is made of the economic effects of soil conservation practices adopted from 1934 to 1938 on 35 demonstration farms in the area. The farms are grouped on the basis of the recommended changes in land use as follows: (1) Depleting crops decreased and conserving crops increased, (2) both types of crops increased, (3) both types of crops decreased, and (4) depleting crops increased and conserving crops decreased.

**Relation of land use to land class in Jefferson County, Tennessee, 1938,** C. E. Allred, H. J. Bonser, R. G. Milk, and J. D. Rush. (Coop. U. S. D. A.). (*Tennessee Sta. Agr. Econ. and Rural Sociol. Dept. Monog. 104 (1940), pp. VI+59, figs. 26*).—This study, made to determine the variations in land use on farms with soils of different productivities, is based on work sheets for 2,391 farms obtained by the A. A. A. in its 1938 agricultural conservation program. In the analysis the farms were grouped by land classes, civil districts, and size of farms. Comparisons are made with the 1935 agricultural census data.

**Land classification: A selected bibliography,** O. E. Goodsell (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 83 (1940), pp. VII+95*).—This bib-

liography consists of 780 references included in the Bibliography on Land Utilization, 1918–36 (E. S. R., 79, p. 266), and from files in the Bureau, catalogs of the libraries of the Department, and indexes to current literature. The material is limited mainly to reports, bulletins, monographs and articles on land classification studies, and reports of field investigations. Also included are references on descriptions and analyses of land-utilization patterns in particular areas, classifications of present land use, inventories of present and potential resources, classifications of land in terms of use capabilities, and general discussions of land classification in its theoretical aspects, and its relation to land policies, *forestry, soils, irrigation, etc. It does not deal with classification of lands according* to types of farming, vegetation, soils, tenure, erosive conditions, etc. An authors' index is appended.

**Foreign Agriculture, [May–June 1940]** (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr., 4 (1940), Nos. 5, pp. 273–330, figs. 25; 6, pp. 331–379, fig. 1*).—No. 5 includes articles on Inter-American Agricultural Cooperation, by H. A. Wallace (pp. 275–286), Tobacco in Principal Producing Countries of the Far East, by J. B. Gibbs (pp. 287–300), and Denmark's Agriculture as Affected by War, by P. G. Minneman (pp. 301–326); and notes on recent developments in foreign agricultural policy as follows: Sicilian colonization project, and France establishes a ministry of supplies.

No. 6 includes articles on Canada's Wartime Agricultural Measures, by C. C. Taylor (pp. 333–354), Japan's Food Self-Sufficiency, by W. Ladejinsky (pp. 355–376), and Control of Agricultural Prices in the United Kingdom, by R. B. Schwenger (pp. 377–379).

**The world food supply: A partial list of references, 1925–1939,** M. T. Olcott (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 82 (1939), pp. VI+164*).—This bibliography of 437 references supplements one of the same title (E. S. R., 53, p. 896). In preparing the bibliography the following subjects were checked: Foods and foodstuffs, raw materials, geography, oils and fats, sugar, and wheat. "The bibliography is arranged geographically—first references on the world subdivided under general, economic geography, grain, nutrition, oils and fats, raw materials, and sugar; [and] then alphabetically by continent, in most cases subdivided by country."

***Supply responses in milk production in the* Cabot-Marshfield *area,* Vermont,** R. H. Allen, E. Hole, and R. L. Mighell. (Coop. Vt. Expt. Sta. et al.). (*U. S. Dept. Agr., Tech. Bul. 709 (1940), pp. 60, figs. 11*).—This study is based primarily on farm management data covering the 2 yr. 1926 and 1936, and is part of a study of interregional competition in the production of dairy products in the New England and midwestern dairy regions. It is an intensive study with respect to past trends of milk production and their causes and prospective responses to different prices. Considerable emphasis is placed on research methodology for the analysis of long-time supply responses. The procedure used in the study is described. In general, it considered "first a most profitable farm organization for each price situation in as realistic terms as possible and then on the basis of personal acquaintance with the farmer and his past record of performance to estimate the effect of subjective factors in causing him to fall short of the point arrived at in the first approximation." The agriculture of northern New England and the Cabot-Marshfield area is described.

The prices per pound for butterfat were 53.7 ct. in 1926 and 44.4 ct. in 1936, and those of feed per ton $49.99 and $35.89, respectively. The index (an unweighted annual average of monthly indexes) of deliveries of milk and cream corrected for farm abandonment was 94 in 1926 and 100 in 1936. The estimated increases in different factors from 1936 to 1946 with present prices and 15 percent higher milk prices are: Number of cows 4 and 8 percent, production per

cow 3.6 and 6.8, total milk production 7.8 and 15.3, total milk sold 8.8 and 16.7, value of dairy products sold 8.6 and 35.3, and total cash receipts 5 and 21.7 percent, respectively. With 15 percent lower prices the estimated decreases are 8.9 percent, 0.4, 9.3, 23.8, and 13.3 percent, respectively.

**Production and consumption of manufactured dairy products,** E. E. Vial. (Coop. State Expt. Stas.). (*U. S. Dept. Agr., Tech. Bul. 722 (1940), pp. 77, figs. 16*).—This study was made "to learn (1) the changes in production and consumption of dairy products, and (2) the relationships between production, foreign trade, and consumption of the individual products, as well as all combined." It was limited to manufactured products. The production, consumption, exports, and imports of butter and cheese are discussed for the period 1849–1938, with shorter periods for other products. Dairy production v. total agricultural production is also discussed. A brief discussion is included of sources of data and technic employed in determining production and consumption of the products. The appendix includes tables showing production, consumption, exports, imports, etc., by years.

The per capita production of different products and the milk equivalent used for each during the periods 1870–79 and 1930–37 were: Butter 13.4 and 17.5 lb.; cheese 4.94 and 4.46; condensed and evaporated milk 0.18, condensed 1.79, and evaporated 13.51 lb.; commercial ice cream 0.002 and 1.638 gal., malted milk 0 and 0.134 lb.; dried whole milk 0 and 0.119; and dried cream 0 and 0.0011 lb. The milk equivalent used for manufactured products is 331 and 467 lb., respectively. For the two periods the milk equivalents of the total exports of manufactured products were 1,258,000,000 and 179,000,000 lb., respectively, and the percentages for the different products were: Butter 19.2 and 16.6, cheese 80.8 and 8.4, condensed and evaporated milk 0 and 59.9, dried milk 0 and 11.6, and other products 0 and 3.5. For imports the amounts were: Milk equivalents 66,000,000 and 711,000,000 lb., butter 44.2 and 15.8 percent, cheese 55.8 and 82.7, condensed and evaporated milk 0 and 0.4, and other products 0 and 1.1 percent. From 1869 to 1914 manufactured dairy products increased at a rate of about 2.99 percent per year as compared with 3.03 percent for general crop production and 2.97 percent for food and feed crops. From 1918–32 the annual increases were 2.49, 0.29, and practically no change.

**Crops and Markets, [April 1940]** (*U. S. Dept. Agr., Crops and Markets, 17 (1940), No. 4, pp. 73–92, figs. 2*).—Included are reports on the number of cattle on feed, crop conditions, farm real estate values, farm wages, grain stocks on farms, prices received by farmers, sugar crop statistics 1939, and indicated yield of winter wheat; and market reports on cotton, dairy and poultry products, feeds, seeds, grains, and livestock and livestock products.

**Seasonal market variations and their importance to Iowa farmers,** E. Hamilton (*Iowa Sta. Bul. P5, n. ser. (1940), pp. 181–208C, figs. 28*).—Charts are included and discussed showing by months, usually for the years 1929–38, (1) the prices (a) at Chicago of beef steers (different grades), choice heifers (1928–37), slaughter cows, veal calves (1901–37), hogs, sheep and lambs, corn, and oats (marketing years 1924–38), (b) at Kansas City for stocker and feeder steers and calves (1933–38), (c) at New York City for 92-score butter, eggs, top prices of dressed chickens and hens, and (d) farm prices of chickens (four markets), and soybeans; (2) receipts of beef steers at Chicago, eggs at New York City, and dressed poultry (four markets); (3) shipments from public markets of stocker and feeder cattle and calves, and sheep; (4) slaughter under Federal inspection of cows and heifers, hogs, and sheep and lambs; (5) cold storage holdings of pork and lard; (6) creamery butter production; and (7) sales of corn and oats in Iowa (1928–37 marketing years).

Other charts included and discussed show the seasonal changes in hog prices in years of increasing and decreasing production, the average weight of hogs marketed, the Iowa butter-feed and egg-feed ratios, the year-to-year changes 1925–38 in these ratios, and the year-to-year changes 1913–38 in Iowa and United States hog-corn ratios.

**Survey of cooperative poultry and egg marketing in Ohio,** R. L. Baker and C. B. McBride. (Coop. U. S. D. A.). (*Ohio State Univ., Dept. Rural Econ. Mimeog. Bul. 126 (1940), pp. [3]+41, figs. 6*).—The development of cooperative poultry and egg marketing in the State, the types of cooperatives, the methods used, quality grading of eggs, basis of payments, distribution methods and outlets, and problems of cooperatives are discussed.

## RURAL SOCIOLOGY

**[Investigations in rural sociology by the Kentucky Station, 1939]** (*Kentucky Sta. Rpt. 1939, pt. 1, pp. 8, 9*).—Included are general findings in studies of the natural increase and migration of the population of the State from 1920 to 1930 and of the movement of population to and from farms in 1938.

**Social organization in Arizona's irrigated areas,** E. D. Tetreau. (Univ. Ariz.). (*Rural Sociol., 5 (1940), No. 2, pp. 192–205*).—In Arizona's irrigated areas the value of land for agriculture depends primarily upon water rights. Here the irrigation enterprise is a basic institution. Probably the most potent regulator of human relationships in the irrigated areas is the family. More than 10 agricultural households were found per square mile of irrigated farm land. "Since more than two-thirds of all agricultural households were laborers, and since commercialized agriculture bids fair to continue a severe competition with family farming and possibly further increase the proportions of laborers, it seems timely to advance tentatively a principle of balance between family and commercial farming. This principle may be stated as a proportioned relation between family and commercial farming by which are locally retained sufficient numbers of farm owners' families to maintain local government and public education at accepted standards and to carry resident laborers' families normally through the year without public or private assistance."

**Social factors associated with land class in Overton County, Tennessee.—A preliminary report,** C. E. Allred, H. J. Bonser, and F. M. Fitzgerald (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 105 (1940), pp. V+36, figs. 22*).—Families on poor lands moved more often than did families on good lands. Over one-third of the rural families, outside of Livingston town, received public relief of some kind during the year 1938. All classes of relief except aid to the blind were heaviest on the poor lands, with work relief showing the closest association with land quality. Public relief was greater for nonfarm than for farm families. In 1935, 3.4 percent of the relief families conducting farming operations had one or more members who had returned to the county from a nonfarm occupation.

**Population trends and adjustments in Arkansas,** W. H. Metzler (*Arkansas Sta. Bul. 388 (1940), pp. 59, figs. 15*).—Migration to other States has exceeded 100,000 persons in each decade since 1890, and between 1920 and 1930 exceeded 280,000, or twice the State's increase in population during that time. Heaviest losses through emigration have been from the northwestern half of the State. Approximately 80 percent of the people were classified by the census of 1930 as rural and 60 as living on farms. The decline in farm population has been both relative and absolute, most of the decrease being in the upland counties.

Birth rates in the rural districts are high in relation to the ability of the area to support population. Average farm wealth per person varied from $346.71 in Stone County to $1,130.63 in Arkansas County; per capita farm incomes from $102.76 to $414.56. Nonfarm incomes in the State averaged $503 in 1929 and farm incomes $185. The population in many of the upland counties is so sparse that efficient community institutions cannot be maintained. The average length of the school term was 124.6 days as compared with 160.3 days in more thickly settled areas. The population process from 1930 to 1935 was in the direction of maladjustment rather than adjustment. Farm population increase was most rapid in those areas already overpopulated, and family farms which were already too small had to be divided. Farm people in those areas where the farm base was most adequate moved to town, and urban migrants moved into adjacent rural areas without particular regard for the actual farming possibilities.

**Migration of Minnesota rural youth,** L. Nelson and D. Mitchell. (Univ. Minn.). (*Rural Sociol., 5 (1940), No. 2, pp. 229–232*).—In 1938 a survey was made of 881 rural youth living in 9 selected townships in 3 counties of Minnesota. It was found that these youth had 470 siblings who were not living at home and who were in the age group 15 to 29. There were 189 young men between the ages of 15 and 29, brothers of youths in the survey, who had left home. Of the 178 for whom this information was available, 70, or 39.3 percent, moved to other open country localities; 54, or 30.3 percent, were living in cities; 35, or 19.7 percent, in towns; and 19, or 10.7 percent, in villages. When these figures are compared with those for young women given in the section following, it is apparent that the young men tend to remain on the land in much larger proportions than do the young women. Of the 470 siblings who were not living at home at the time of the survey, 281, or 59.8 percent, were females. The majority of these (197) had entered "domestic" occupations of one form or another. The next largest group entered professional occupations. These are chiefly teachers. It appears that the larger the center the greater its attraction for the women. Of 266 girls away from home, 114 were living in cities, 53 in towns, 44 in villages, and 55 in the open country. The contrast between the last and the first figures is all the more striking when it is realized that the open-country group includes the wives of farmers. In the recovery period from 1933 to 1937, the pattern of migration from farms to towns and cities has not changed. As has been shown in other studies, the urbanward migration tends to select a larger proportion of young females. As to the volume of this migration, which presumably had slowed down considerably during the early years of the depression, these data seem to suggest that it is swinging back toward normal.

**Basic trends of social change in South Dakota.—V, Public health facilities,** W. F. Kumlien (*South Dakota Sta. Bul. 334 (1940), pp. 30, figs. 27*).—This is one of the series previously noted (E. S. R., 81, p. 729). There seems to be a slow but sure trend toward public health facilities replacing those operating under private auspices. South Dakota has a high average length of life. This is due largely to the low death rate, which in turn is based upon a number of other factors such as decreasing infant mortality rate, favorable age distribution of the population, nonindustrialization of the State, and lack of overcrowded conditions. The functions of the State Board of Health are becoming of increasing importance. The main hospital problem in South Dakota is not to add to the number but to improve the quality and completeness of service rendered by those already in existence and to educate more people to the idea of hospitalization.

**Fertility in rural areas in relation to their distance from cities, 1930,** W. S. THOMPSON and N. E. JACKSON (*Rural Sociol., 5 (1940), No. 2, pp. 143–162*).—"No two areas present identical pictures of the relationship between fertility, as measured by the ratios of children under 5 to persons 15 to 44, ance of urban influence on fertility is somewhat discredit in a few areas." influence, the economic status of the family, and the demographic characteristics of the population. Even when two areas extending out from the same city are compared they are found to differ in many respects, and the age-old acceptance of urban influence of fertility in somewhat discredited in a few areas."

**House over-crowding prevalent in many rural Utah communities: Bedroom space found inadequate in most Utah homes,** J. A. GEDDES (*Farm and Home Sci. [Utah Sta.], 1 (1940), No. 2, p. 12, figs. 2*).—In a study of seven rural communities in which conditions were believed similar to those in many rural areas, it was found that in many homes the house is too small. A house with one room per person exclusive of halls and bathrooms is held adequate by housing authorities. The average number of people in the household for these communities was 4.8, and for the two communities where the one- and two-room houses were greatest the average size of household was larger still, being 5.1 and 5.2. Only a little over half of the families possessed houses reaching the standard of one room per person, the percentage for farm families being 52.5 and for nonfarm families 54.6.

## AGRICULTURAL AND HOME ECONOMICS EDUCATION

**History of the North Carolina State College of Agriculture and Engineering of The University of North Carolina, 1889–1939,** D. A. LOCKMILLER (*Raleigh: Edwards & Broughton Co., 1939, pp. [XVIII+310, [pls. 19, figs. 9]*).—This volume was prepared on the occasion of the fiftieth anniversary of the founding of the college.

**A history of agriculture in Europe and America,** N. S. B. GRAS (*New York: F. S. Crofts & Co., 1940, 2. ed., pp. XXVII+496, [figs. 5]*).—This second edition of the book previously noted (E. S. R., 53, p. 397) includes a chapter covering the period 1920–40 and minor changes in several chapters.

**Elements of farm management,** J. A. HOPKINS (*New York: Prentice-Hall, 1940, rev. ed., pp. XXI+489, [pl. 1], figs. 89*).—This revised edition (E. S. R., 75, p. 130) includes additional information on labor, feed, power, and other crop and livestock requirements, and discussions of the principles of farm appraisal, opportunity, costs, and size of farm as related to farm management and income.

**Practical farming for beginners,** H. A. HIGHSTONE (*New York and London: Harper & Bros., 1940, pp. X+199, [pls. 10]*).—"This volume is an outline of agriculture addressed primarily to the city man who is convinced that he will be better off earning his livelihood from the land. In part, it is a narration of why city families usually fail in their attempts to find rural independence."

**Workers in subjects pertaining to agriculture in land-grant colleges and experiment stations, 1939–40,** M. A. AGNEW (*U. S. Dept. Agr., Misc. Pub. 378 (1940), pp. V+170*).—This is the usual annual list (E. S. R., 81, p. 300) showing the workers in agriculture and home economics, the personnel of the Office of Experiment Stations, and the officers and standing committees of the Association of Land-grant Colleges and Universities.

## FOODS—HUMAN NUTRITION

**The effect of different wrappings, temperatures, and length of storage on keeping qualities of frozen pork chops,** R. M. Griswold and L. H. Blakeslee. (Mich. Expt. Sta.). (*Amer. Soc. Anim. Prod. Proc., 32 (1939), pp. 305–314; abs. in Michigan Sta. Quart. Bul., 22 (1940), No. 4, p. 296*).—The hogs used in this test were a good grade of market hogs, the animals including several pure- and cross-breeds and all having received the same ration. The chops, cut ⅝ in. thick from the carcasses immediately after cooling at 32°–36° F. for 48 hr., were assembled in representative groups of 4 from different hogs, each chop being identified by number as to carcass and treatment to be given. The chops were frozen in a cabinet type of freezer at −15° for 24 hr., after which each group of 4 was taken from the quick freezer and wrapped for storage. Seven different types of wrappings were used and 4 packages of each type of wrapping were stored at 0°, 5°, and 15°, respectively, thus permitting sampling for each wrapper and temperature after 60, 120, 180, and 240 days of storage. The wrappings included a kraft wrapping paper, a brown waxed whalehide, a moisture-proof cellophane, peach cartons lined with a latex rubber-coated, heat-sealing paper (Thermo M), and coatings obtained by dipping individual chops in a mixture of pure lard and 0.5 percent oat flour, or in a mixture of ¼ tallow, ¾ lard, and 0.5 percent oat flour, or in water at 32°. The chops, which had been weighed before and after freezing, were weighed again upon removal from storage, thawed at room temperature, braised by standard procedure, and graded by an experienced panel of judges, using the palatability chart of the National Cooperative Meat Project. The data on shrinkage, calculated as the difference between the weight before storage and the weight after storage divided by the weight before freezing, and the scores for the various palatability factors are tabulated.

The results, subjected to statistical analysis for determination of significance, permitted the folowing conclusions: "Wrappings had little effect on the palatability of the chops under the experimental conditions used, but had a decided effect on moisture loss. Kraft wrapping paper permitted the greatest moisture loss, whalehide was next, Thermo M, lard, and lard and tallow were about the same, while cellophane allowed less moisture to escape than any of the other materials. The palatability of the chops decreased and shrinkage increased as the storage period lengthened. Most of the chops were still edible after 180 days' storage, although the fat of some of the chops was rancid. Several palatability factors seemed better in chops stored at 15° than in those stored at 0°, probably due to temperature fluctuations in the 0° box. Little difference was found between chops stored at 5° and 15°."

**Sharp freezing of N. D. grown vegetables and fruits for cold storage lockers,** D. Knowles and O. Grottodden (*North Dakota Sta. Bimo. Bul., 2 (1940), No. 5, pp. 10–13, figs. 2*).—This report of the first year's investigation of adaptability to quick freezing of varieties of North Dakota fruits and vegetables and on the selection of methods of preparing and freezing to give best results is written in such a way as to serve as a useful manual on the selection of varieties and preparation for freezing. Of 11 varieties of peas tested, 5 proved satisfactory under North Dakota growing conditions—Topnotch, Gilbo, Glacier, Thomas Laxton, and Laxton Progress; of 7 varieties of sweet corn, 3 —Golden Bantam, Golden Gem, and Kingscross; and of 6 varieties of wax beans, 3—Topnotch, Golden Wax, and Webber Wax. The 2 varieties of lima beans tested (Fordhook Bush and Jackson Wonder) and the 4 varieties of green beans (Bountiful, Green Pod Stringless, Dwarf Horticultural, and Plentiful) proved satisfactory.

A table is included of recommended types of pack and containers for corn (whole-cut and on-the-cob), green beans, lima beans, wax beans, peas, and raspberries. Corn proved better when frozen off-the-cob than on-the-cob, lima beans and corn when frozen in 2 percent salt solution than in dry pack, and wax beans, green beans, and peas in dry pack. Raspberries were best when frozen in a 50 or 60 percent sirup. Glass jars were recommended for all except the corn-on-the-cob.

**Home production of food supplies, J. J. Bird** (*Tennessee Sta. Rpt. 1938, pp. 28–34*).—This report summarizes the data for 1938 on the dietary, food consumption and costs, and health records and on the yield of various subsistence crops and livestock in the 12 Crossville Homestead farms.

**Data on the chemical composition of the more important varieties of Hungarian plums** [trans. title], E. Becker (*Ztschr. Untersuch. Lebensmtl., 78 (1939), No. 5, pp. 403–407*).—Data on the percentage of dry matter, total sugar, and total acid are reported for 91 samples of plums of four native varieties, designated as to the region (Hungarian) in which they were grown.

**Some effects on animal nutrition of the ingestion of mineral oil, M. C. Smith** and H. Spector (*Arizona Sta. Tech. Bul. 84 (1940), pp. [2]+371–395, figs. 3*).—Rats and dogs were used as experimental animals in studies designed to determine the effect of mineral oil ingestion, at 5 and 10 percent levels and incorporated in the daily ration, on the assimilation of vitamins A and D. In groups of rats carefully matched as to litter mates and distribution of the sexes and placed at weaning on a basal diet of one-third dry whole milk, two-thirds whole wheat, and 1.6 percent salt, no difference as to growth rate was observed between the control group and those receiving the two levels of mineral oil over a period of 1 yr. The reproductive performance of the females was markedly affected, however. At the 10 percent level of feeding the females showed a shortened period of fertility, produced only one-third as many litters as their nonoil-fed litter mate sisters, and were less successful in raising their young to weaning age. Moreover, the young of female rats reared on rations containing mineral oil were less able to withstand subsequent deprivation of vitamin A, as indicated by an earlier break in resistance to respiratory infections and shorter survival periods on a vitamin A-free regime. This behavior of the young was indicative of small stores of vitamin A.

Further evidence of low vitamin A reserves in rats receiving mineral oil was obtained by analysis of the livers of the animals; whereas the livers of rats on the basal diet averaged 130 and 73 blue units for the females and the males, respectively, the corresponding values for rats receiving 5 and 10 percent of mineral oil were 16 and 11 and 8 and 6, respectively. Mineral oil ingestion was also found to interfere with the utilization of vitamin D fed separately as cod-liver oil. Three times as much cod-liver oil was necessary to induce healing of the rachitic lesions of rats when the basal ration contained 5 percent of mineral oil as was necessary with the control animals receiving no mineral oil; between 5 and 10 times as much cod-liver oil was required for healing when the basal ration contained 10 percent of mineral oil.

"'Balance studies' showed that mineral oil ingestion by young dogs interfered with the retention of both calcium and phosphorus so seriously that normal calcification of the bony structure was not possible. The mineral oil-fed dogs showed the characteristics of severe rickets even though they received adequate amounts of calcium and phosphorus and were given a supposedly minimum protective dose of cod-liver oil. Increasing the amount of cod-liver oil fivefold did not provide for optimum retention of the mineral elements in the dog receiving the ration containing 10 percent mineral oil.

"These findings lead to the conclusion that the continuous ingestion of mineral oil in amounts probably not greater than the corresponding therapeutic dose for humans seriously interferes with the utilization of vitamins A and D in rats and dogs and thus adversely affects animal nutrition."

**Nutrition [at the Hawaii Station]** (*Hawaii Sta. Rpt. 1939, pp. 61–63*).—Progress is reported (E. S. R., 81, p. 736) on chemical analyses, by C. D. Miller and L. Louis, of Hawaiian-grown vegetables; an extension of the study by M. Potgieter of the dietary habits of independent farmer families in Hawaii and the nutritional condition of the children of these families; and anemia and blood studies by C. J. Hamre, including the influence of iron on blood-forming organs of anemic animals, the capillary hematocrit method of determining blood cell volume, hemoglobin and blood cell levels of preschool children, and a survey of blood values of young men and women.

**Soybeans valuable in the diet,** D. Dickins (*Miss. Farm Res.* [*Mississippi Sta.*], *3* (*1940*), *No. 5, p. 1*).—This brief descriptive article is based on cooking tests made on 134 varieties of edible soybeans grown at the station from seeds furnished by the U. S. D. A. Bureau of Plant Industry.

**Food needs of young adults object of study** (*Ohio Sta. Bul. 600* (*1939*), *pp. 58, 59*).—This progress report on certain phases of the North Central States cooperative project on the nutritional status of college women discusses the significance of the investigation and refers in general terms to some of the comparative results already obtained.

**Food consumption studies [by the South Carolina Station],** A. M. Moser (*South Carolina Sta. Rpt. 1939, pp. 22–24, fig. 1*).—In this progress report (E. S. R., 81, p. 141) a summary is given of a comparison of the diet patterns of groups of farm families in the Piedmont and Coastal Plains areas, as obtained from earlier studies (E. S. R., 73, p. 557; 81, p. 866) and the tobacco-cotton farming area from figures secured by the U. S. D. A. Bureau of Home Economics in the consumer purchases study.

**[Food and nutrition studies by the Wyoming Station]** (*Wyoming Sta. Rpt. 1939, pp. 19–21*).—This progress report (E. S. R., 81, p. 591) notes some of the findings in studies on the home canning of green beans, the effect of storage on the ascorbic acid content of potatoes, the preservation of freezing of compressed yeast for bread making, and the basal metabolism of male college students.

**The metabolism of calcium and phosphorus,** C. I. Reed. (Univ. Ill.). (*Jour. Amer. Dietet. Assoc., 15* (*1939*), *No. 8, pp. 667–674*).—This discussion, presented as an address, is concerned with the physiological importance of calcium and phosphorus. The demands for these elements, their functions, the factors governing absorption, and the controlling mechanisms in calcium and phosphorus metabolism are discussed. Special reference is made to the thyroids, the parathyroids, the pituitary, and the relation of pituitary and thyroid to vitamin D as controlling factors.

**Iron, copper and manganese in human organs at various ages,** G. Brückmann and S. G. Zondek (*Biochem. Jour., 33* (*1939*), *No. 11, pp. 1845–1857, fig. 1*).—Values for total and nonhemin iron and for copper, determined in the livers and kidneys of a series of 75 autopsy cases, are reported according to the age of the individuals. Manganese determined in a number of livers is similarly reported. Occasionally other organs were also examined. The methods used, some of them representing improvements on existing procedures, are discussed. The results also are discussed in detail in the light of present knowledge.

The results for liver and kidney indicated a characteristic life curve for the percentage of total iron and particularly for nonhemin iron. The values found at birth were high, averaging in the case of nonhemin iron within the age of 0 to 15 days 1,770 and 205 mg. per kilogram of dried liver and kidney tissue, respectively; they then dropped to a minimum at the age of about 2 yr., averages of 170 and 78 mg. of nonhemin iron per kilogram of dried liver and kidney tissue being found for this period (15 mo. to 3 yr.). Above this age the values increased slowly at first and then more rapidly, remaining at about the same level from the age of 20 yr. to the end of life. In the case of healthy adults the nonhemin iron contents of the liver and kidney were remarkably constant, the mean values being 800 and 160 mg. per kilogram of dried substance, respectively.

Although the values in the newborn were in general quite high, it is pointed out that there were exceptions. Other work is cited to indicate that the bulk of the nonhemin iron is not accumulated until after birth, when the postnatal blood destruction reduces hemoglobin values liberating large amounts of iron, some of which is excreted and much of which is mobilized in the liver. It is also pointed out that the minimum iron values are not reached after weaning, as would be expected from the classical theory that iron stores are drawn upon during the period of lactation, but are reached at about the age of 2 yr. after the child has lived on a normal diet for some time. Severe anemias appeared to reduce the iron content of organs to a minimum identical with the minimum values of childhood. Blood transfusion was found to increase definitely the nonhemin iron of both liver and kidney.

The life curve of the liver-copper content showed the familiar maximum at birth, the average value for liver in 14 infants (0–1½ mo.) being 230 mg. per kilogram of dried substance. This level was followed by a sharp decline after the second month. The average value for adults was 34.6 mg. per kilogram of dried substance. Kidney and brain did not show maximum values at birth. The copper values for thymus, hypophysis, and thyroid were very low, between 4 and 20 mg. per kilogram of dried substance; the iron content of the same organs was between 100 and 300 mg. per kilogram of dried tissue. The copper content of the liver was found to be markedly increased in a case of tuberculosis. The manganese content of the liver was constant throughout the life span, 7.0 mg. per kilogram of dried material being the average value obtained. Several samples of blood serum gave values for manganese from 1 to 3 $\mu$g. per 100 cc.

**A manual for diabetic patients,** W. D. Sansum, A. E. Koehler, and R. Bowden (*New York: Macmillan Co., 1939, pp. X+227, pls. 2, figs. [10]*).—This book, written to familiarize the patient with the nature of diabetes, is intended to serve as a guide to augment the specific and individual instruction he receives as a patient. The first part of the book deals with food utilization and its relation to diabetes; the diagnosis of the disease; the treatment, by diet and with insulin; general factors in management; insulin reaction, acid-base balance, acidosis and coma, and the distinctions between severe insulin reaction and diabetic coma; complications; surgery and pregnancy in diabetes; and laboratory tests for the patient.

The second part gives detailed consideration to the dietary management of diabetes. The weighing and measuring of foods, their composition and calorie value, and practical translation of dietary treatment in terms of actual menus, recipes, and substitutions are matters included in this section. The diet plan presented aims to supply ample amounts of minerals and vitamins and to meet

the normal weight and energy requirements. In order to parallel more closely the slow liberation of insulin by the new insulin compounds, diets have been arranged with frequent feedings and with reference to the distribution of foods. A table of food values, height-weight-age tables, and a glossary of terms are appended.

**Vitamin A values, F. L. MacLeod and E. Utley** (*Tennessee Sta. Rpt. 1938, p. 64*).—This progress report summarizes the results obtained in a completed study of the effects of cooking and storage on the vitamin A values of Porto Rico sweetpotatoes, Chantenay carrots, Amber Globe turnips, and rutabagas. Preliminary work on the Nancy Hall variety is also noted.

**Studies in vitamin A: Relation of vitamin A and carotene to serum lipids, H. W. Josephs** (*Bul. Johns Hopkins Hosp., 65 (1939), No. 1, pp. 112–124, figs. 6*).—In the introduction to this paper attention is called to the fact that there is as yet no method for determining storage deficiency in vitamin A, and "not everyone agrees on the propriety of defining vitamin A deficiency in terms of adaptation tests." In the hope of clearing up some of the doubtful points in the use of blood tests for the assessment of the body's supply of vitamin A, a survey was made of the relation between total lipide content of the blood and the blood levels of vitamin A and carotene. Blood samples were obtained from patients suffering from a variety of pathological conditions and with lipide values ranging from high to low. Vitamin A and carotene determinations were made by essentially the method of Clausen and McCoord (E. S. R., 76, p. 585) both with direct comparisons of color and with the use of the photoelectric colorimeter. The technics for this method and for the methods for determining total lipides and cholesterol are described in detail.

The results obtained showed a good correlation between carotene and total lipides, a fairly close relationship between vitamin A and lipides, and a close relationship between lipides and cholesterol. The only definite conclusion that could be drawn, however, is that there is an obvious relationship between vitamin A, carotene, and total lipides of the blood. It is suggested that the basis for this is the fat-solubility of vitamin A and carotene. Whether the concentration of vitamin A in the fat of the plasma is more significant than in the plasma itself cannot be stated with certainty, although certain observations indicate that such is the case. In some instances of low blood fat there was almost no increase in blood vitamin A after the ingestion of a large amount of the vitamin. In others high values in blood fat were associated with high carotene and vitamin A values, but in certain cases of dietary deficiency of vitamin A the blood fat was not low.

**Simple method of measuring brightness threshold of dark adapted eye at all ages, C. Haig and J. M. Lewis** (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 2, pp. 415–418, fig. 1*).—The apparatus and procedure described with working diagram were developed during the course of an investigation of the vitamin A requirements of infants (E. S. R., 79, p. 711). The procedure, as followed with infants, involves the determination of the final or equilibrium threshold for dark adaptation by the use of a portable instrument with the test light unit so constructed as to fit into the hand of the operator. The infant is placed on his back and a radium paint pendant such as is used on electric light chains is attached to the center of the forehead with adhesive plaster. After 30 min. of darkness the operator moves the test light unit slowly from side to side through an arc of 180° at a distance of about 10 cm. from the eyes of the infant, increasing the intensity of the light with each move until the infant sees it in the periphery of his visual field and turns his head in a corresponding direction, the motion being indicated by the luminous tube. When used for children and adults, violet light differentiates between the cones and rods, and

an approximate measure of the speed of dark adaptation is obtained by exposing the eyes to a bright light for 2 or 3 min., after which observations of the descending threshold are made at frequent intervals until the dark adaptation is relatively complete.

**Influence of vitamin A upon urea clearance in the rat,** R. C. HERRIN. (Univ. Wis.). (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 3, pp. 695–699*).—In rats on a high protein diet, deprivation of vitamin A led, with one or two exceptions, to a 23–77 percent decrease and the administration of carotene to a 30–170 percent increase in urea clearance. Examination of the urine and histological sections of the kidneys showed no marked morphological alterations.

**Metabolic interdependence of vitamin $B_1$ and manganese: Reciprocal neutralization of their toxic effects,** D. PERLA and M. SANDBERG (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 2, pp. 522–527, fig. 1*).—This report elaborates upon and extends the observations presented in a preliminary communication (E. S. R., 82, p. 279). The experiments for which the data are here presented had shown that rats receiving normal adequate diets and a large excess of vitamin $B_1$ exhibited interference with the capacity of the mother to rear her young and with the nursing instinct. These toxic manifestations were prevented by the addition of small amounts of manganese to the diet. Further studies confirmed these observations. With an excess of 400γ of vitamin $B_1$ given parenterally, the toxic manifestations were pronounced in the parent generation but became progressively worse in the $F_1$ and $F_2$ generations, the young in the latter case being neglected and eaten in over 90 percent of the litters. The addition of manganese to the diet at the level of 2 mg. per rat per day prevented these toxic manifestations over three generations. At the level of 0.5 mg. per rat per day the manganese was apparently even more effective. Without any excess of vitamin $B_1$, supplements of manganese alone in amounts of 2 mg. per rat per day interfered with lactation and favored cannibalism, particularly after one generation. "It is inferred that manganese acts as an essential catalyst in oxidative processes in which vitamin $B_1$ is concerned. The vitamin $B_1$ requirement of an animal varies with the manganese content in its diet."

**Interdependence of vitamin $B_1$ and manganese, II, III** (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 2, pp. 368–371, 371–374*).—This is a continuation of the study noted above.

II. *Manganese, copper, iron metabolism in $B_1$ deficient rats,* M. Sandberg, D. Perla, and O. M. Holly.—This study deals with the metabolism of manganese during the development of and recovery from vitamin $B_1$ deficiency. Young rats being brought to depletion during a 5-week period on a vitamin $B_1$-free diet admitting of an average daily intake of 0.064 mg. of manganese retained on an average 18 percent of the ingested manganese. Control groups on the basal diet plus a supplement of crystalline vitamin $B_1$ retained 19 percent of the ingested dietary manganese. When 1 mg. of manganese per rat per day was fed with the diet, manganese was stored, the retention over a 3-week period averaging 72 percent. Vitamin $B_1$ deficiency symptoms having developed at this stage, vitamin $B_1$ (400γ per rat per day) was given intraperitoneally, the oral manganese supplements being continued. During a 4-week period on this regime, the storage of manganese in the test group averaged only 34 percent. Controls during these two latter periods retained 25 percent of the manganese intake. With discontinuation of the manganese supplement on this high vitamin regime, the manganese previously stored continued to be excreted, negative balances being obtained. These findings illustrate the effect of excess vitamin $B_1$ in exhausting manganese stores.

III. *Manganese, copper and iron metabolism in normal rats*, D. Perla, M. Sandberg, and O. M. Holly.—Data are presented on the average daily manganese and copper metabolism of rats during several experimental periods. During the 5-week control period on a stock diet supplemented with 10 percent of whole milk powder and 3 percent of dried brewers' yeast and furnishing about 100γ of manganese and 74γ of copper daily, the animals did not store any manganese but did retain about 30 percent of the copper. In the first monthly test period that followed, the manganese intake was raised by about 50 percent, the copper intake remaining unchanged. On the slightly higher manganese level there was a retention of about 25 percent, which was not increased even when the manganese intake was raised to over 13 mg. On these higher manganese intakes the copper retention dropped. This relationship suggests that less copper may be required for oxidative purposes if large amounts of manganese are available. The administration of 400γ of vitamin $B_1$ along with the high level of manganese (13.64–14.82 mg.) increased the retention of this element to 41 percent in the first week and to as much as 54 percent in the second week; the copper retention was not affected during the first week but increased after that to 21 percent of the intake. It is suggested, therefore, that large amounts of manganese and vitamin $B_1$ offered simultaneously may permit a better utilization of copper as well as manganese. When manganese addition was stopped while the vitamin $B_1$ administration continued, the manganese retention became negative, and the copper dropped again to 15 percent of the intake, for 1 week; during the following weeks both manganese and copper retentions dropped to normal levels, and continued administration of vitamin $B_1$ failed to influence copper metabolism as long as the manganese intake remained at 100γ daily.

**The usefulness of the thiochrome procedure for the study of vitamin $B_1$ metabolism** [trans. title], J. Baucke (*Klin. Wchnschr., 18 (1939), No. 33, pp. 1128–1131, figs. 2*).—It is considered that this method, applied to the urine of persons in a normal nutritional state, gives values that, on an average, are about 7γ percent too high. This is due to the lack of specificity of the reaction. Individuals on a diet furnishing about 600γ of the vitamin were found to eliminate about 6 to 18 percent of it in the urine. With higher intakes, higher percentages seemed to be eliminated, and upon the injection of from 1,000γ to 5,000γ of the vitamin about 20 to 36 percent was found to be excreted in the urine.

**Injection studies with vitamin $B_1$** [trans. title], I. Magyar (*Klin. Wchnschr., 18 (1939), No. 34, pp. 1157–1160*).—Values reported for 24-hr. urinary elimination of vitamin $B_1$, as determined by a thiochrome procedure of Ritsert, showed great variability in the spontaneous elimination on a mixed diet with or without oral vitamin $B_1$ supplements. These values are considered as only approximately indicative of the vitamin $B_1$ status of the body. Single doses of vitamin $B_1$, usually in 10-mg. amounts, were injected intravenously in normal and sick persons, some of the latter of known dietary history being in a state of hypovitaminosis. Individuals considered normal with respect to vitamin $B_1$ were found to eliminate various proportions of the injected vitamin in the 24-hr. period, but the amounts were always above 18 percent, in contrast with those in a state of hypovitaminosis who always eliminated less than this percentage of the injected dose. Multiple doses injected upon successive days were found to be eliminated in increasingly greater amounts in conditions of hypovitaminosis. Under the same circumstances, however, the elimination in the case of normal persons was very erratic, and if anything the proportion eliminated appeared to decrease as the amount injected increased. The data

reported are interpreted to indicate that the best procedure for detecting vitamin $B_1$ hypovitaminosis is that of investigating the percentage of elimination of a single intravenously injected dose.

**Is pantothenic acid essential for the growth of rats?** J. J. OLESON, D. W. WOOLLEY, and C. A. ELVEHJEM. (Univ. Wis.). (*Soc. Expt. Biol. and Med. Proc.*, *42 (1939), No. 1, pp. 151–153*).—Using a basal ration similar to those used in earlier work on the differentiation of the vitamin B complex (E. S. R., 81, p. 450), the authors have demonstrated that the rat needs in addition to the crystalline factors supplied in the ration (thiamin, riboflavin, synthetic vitamin $B_6$, nicotinic acid, and choline) an alkali-labile factor, which is probably pantothenic acid. A relatively crude preparation from liver extract containing about 10 percent of pantothenic acid as determined by bacterial assay, a small sample of crude crystalline material made from the lactone of the hydroxy acid portion of the pantothenic acid molecule and reconjugated with $\beta$-alanine, and the original liver extract were used as sources of pantothenic acid.

Liver extract fed at a level of 250 mg. daily promoted growth at a rate of 3.4 gm. per day over a 6-week period in rats which had ceased to grow at weights varying from 40 to 60 gm. The crude preparation of pantothenic acid fed in amounts sufficient to supply 100 $\mu$g. of pantothenic acid promoted a growth rate of 2.4 gm. and the alkali-treated concentrate a growth rate of 1.5 gm. when fed in amounts equivalent to 50 $\mu$g. of pantothenic acid, and only 1.7 gm. when the dosage was tripled. The crude crystalline material gave an average growth rate of 1.1 gm. per day when fed at a level equivalent to 50 $\mu$g. The failure of the concentrates completely to replace the original liver extract or crude filtrate preparation is attributed to lack of factor W. Since the alkali-treated concentrate contained both $\beta$-alanine and the dihydroxy fractions, it is concluded that the rat apparently requires the intact pantothenic acid molecule. There was no significant stimulation due to the $\beta$-alanine as present in the alkali-treated concentrates.

**The relationship of the P–P factor to gastrointestinal motility,** L. A. CRANDALL, JR., F. F. CHESLEY, D. HANSEN, and J. DUNBAR (*Soc. Expt. Biol. and Med. Proc.*, *41 (1939), No. 2, pp. 472–474*).—Favorable results obtained in the treatment with vitamin B complex of functional digestive tract disorders, characterized by distress, flatulence, and constipation at times alternating with loose stools, led to attempts to determine if thiamin, riboflavin, or nicotinic acid alone might be responsible for the effectiveness of the complex. Negative results were obtained with thiamin and riboflavin, but in 40 cases treated with nicotinic acid in doses ranging from 75 to 200 mg. daily, satisfactory results were obtained in 60 percent of the number as compared with 70 percent in 45 treated with the B complex. Marked intestinal hypermotility was noted on roentgen ray examination of several of the patients before treatment, and was also shown in dogs after 3–5 weeks on a blacktongue-producing diet. In 3 of the dogs the periods of hypermotility were interrupted by periods of hypomotility. It is concluded that nicotinic acid or any of its derivatives capable of replacing it in the diet "is essential to the maintenance of normal gastrointestinal motility, and that absence of this factor leads to motor dysfunction of the intestinal tract prior to the appearance of the usually accepted deficiency symptoms." It is thought possible that other factors of the vitamin B complex may also be concerned with gastrointestinal function.

**Nutritional achromotrichia,** J. J. OLESON, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, *42 (1939), No. 1, pp. 283–285*).—This term is used to describe the loss of hair pigmentation in rats

first described by Morgan and Simms (E. S. R., 81, p. 743) and Lunde and Kringstad (E. S. R., 82, p. 853) as due to lack of one of the filtrate factors of the vitamin B complex. It is noted that nicotinic acid and vitamin $B_6$ as well as the chick antidermatitis factor have been eliminated as causative factors by Lunde and Kringstad. The present study was concerned with the possible identity of the factor with factor W (E. S. R., 78, p. 285), pantothenic acid, and the spectacled eye factor (E. S. R., 81, p. 450). Various concentrates of these factors of known potencies were used in the cure and prevention of achromotrichia in piebald rats. The basal ration on which achromotrichia usually developed in 6–10 weeks consisted of sucrose 67 percent, purified casein 18, salt mixture III of Arnold and Elvehjem (E. S. R., 81, p. 876) 4, butterfat 9, and cod-liver oil 2 percent, with individual daily supplements of thiamin 10γ, riboflavin 20γ, and vitamin $B_6$ 10γ.

Liver extract and the fuller's earth filtrate of the liver extract were very effective at a level of 250 mg. daily. The fuller's earth eluate, which had proved effective in preventing paralysis and hemorrhagic disease in rats, was inactive when fed at a level equivalent to 1 gm. of the liver extract daily. Synthetic nicotinic acid, adenylic acid, and vitamin $B_6$ were without effect. Corn oil capable of preventing symptoms of acrodynia in rats and of preventing and curing the spectacled eye condition curable with fuller's earth filtrate was ineffective in doses of 3–4 drops daily. Of three pantothenic acid concentrates tested, the acid-ether extract and chloroform residue fractions of Woolley et al. (E. S. R., 80, p. 673) and the barium salts preparation described by Oleson et al. (E. S. R., 81, p. 450) were fed at levels equivalent to 1 gm. of liver extract daily for the first two and at a level equivalent to 100γ of pantothenic acid for the third concentrate. None of these preparations prevented the appearance of achromotrichia, although in most instances the time of onset of the symptoms appeared to be delayed. This effect was not observed when the concentrate was treated with alkali to destroy pantothenic acid. Two preparations of factor W, a hexane butanol extract and an acetone eluate of liver extract, proved inactive. Rusting of the fur of albino rats and lack of correlation of the appearance of achromotrichia with growth were also observed.

**Experiments on the antidermatitis component of the filtrate factor in rats**, P. György, C. E. Poling, and Y. Subbarow (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 3, pp. 738–740*).—Rats fed a basal diet deficient in vitamin B [complex] and supplemented with vitamin $B_1$ and riboflavin and treated with pure vitamin $B_6$ until the specific acrodynia was modified or cured still presented certain skin lesions. Most commonly these began as sores around the mouth and as scaly dermatitis visible at first around the axillae, the groin, and over the back between the scapulae. Later, alopecia followed. Complete cure of these manifestations was effected by liver or yeast or by a filtrate fraction from extracts of wheat germ, yeast, or rice polishings that had been adsorbed on fuller's earth.

To determine whether the curative component corresponds to the chick antidermatitis factor recently identified with pantothenic acid, a purified but still crude zinc salt of pantothenic acid was tested. This proved to be active in the cure of the specific skin lesions and in promotion of growth in rats fed a diet devoid of the filtrate fraction. Autoclaving at pH 10 destroyed the activity of the preparation.

**Pathology of $B_6$ deficiency in the rat and response to treatment with 2-methyl-3-hydroxy 4,5-dihydroxymethyl-pyridine (vitamin $B_6$)**, W. Antopol and K. Unna (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 1, pp. 126, 127*).—In this preliminary report the histopathology of vitamin $B_6$ deficiency in

the rat and the histogenesis of the changes effected by synthetic vitamin $B_6$ are described. The results are considered to make possible differentiation of lesions due to $B_6$ deficiency from those of the remaining members of the B complex.

**Determination of vitamin C nutrition by means of a skin test: A critical evaluation,** G. A. GOLDSMITH, D. F. GOWE, and A. T. OGAARD (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 2, pp. 370–374, fig. 1*).—Further evidence is given in support of the conclusions of Poncher and Stubenrauch (E. S. R., 80, p. 565) and of Jetter that the intradermal ascorbic acid test of Rotter, as described by Portnoy and Wilkinson (E. S. R., 79, p. 570), is not a satisfactory method for determining the state of vitamin C nutrition. In 100 observations on 45 subjects there was no correlation between the ascorbic acid in the blood in the fasting state and the time of decolorization of the injected dye either in single tests or in repeated tests during a period of saturation.

**Determination of ascorbic acid in feces: Its excretion in health and disease,** H. CHINN and C. J. FARMER (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 2, pp. 561–566*).—A full description is given, with an example and necessary calculations, of a procedure which has been developed for the application of the Farmer and Abt method of determining ascorbic acid in blood (E. S. R., 74, p. 135) to its determination in feces. In principle the method consists in estimating the total indophenol-reducing substances of the feces, treating an aliquot of the feces with an ascorbic acid oxidase, and again determining the reducing value. The difference between the two values represents the ascorbic acid present.

Data are reported on the recovery of added ascorbic acid by this method, an average of 98.2±0.6 percent being obtained in 13 cases, and on a series of plasma, urinary, and fecal ascorbic acid determinations on a single subject following the administration of varying amounts of *l*-ascorbic acid by mouth over a 4-week period. With ascorbic acid intakes averaging 73, 255, 547, and 1,054 mg. for the 4 successive weeks, average values for plasma ascorbic acid were 0.85, 1.43, 1.71, and 1.61 mg. per 100 cc., respectively; urinary ascorbic acid 21.67, 119.18, 315.10, and 405.55 mg., respectively, and fecal ascorbic acid 5.53, 9.81, 13.80, and 11.34 mg., respectively. In 12 normal young male medical students on their customary mixed diet, an average daily fecal excretion of 4.92 mg. ascorbic acid was obtained. Although large variations in the dietary intake appeared to affect the fecal excretion only slightly, there was great variation in patients suffering from various gastrointestinal disorders. In the case of esophageal stricture the daily fecal excretion over a period of 14 days averaged 1.5 mg., although 1,000 mg. had been given intravenously. In a case of colitis, with many liquid stools, the fecal excretion amounted to 34 mg. following an intake of only 450 mg.

**How much vitamin C is needed by the normal person?** A. P. BROWN (*Farm and Home Sci.* [*Utah Sta.*], *1 (1940), No. 2, pp. 1, 10*).—Using 50 mg. of ascorbic acid as the minimum requirement of vitamin C, the author has calculated from ascorbic acid analyses made at the station of some common foods the amounts in ordinary servings required to furnish 50 mg. of ascorbic acid. The foods studied included grapefruit; lemons; Valencia and navel oranges; canned orange juice; raw fresh peas; frozen peas; raw and home-canned raspberries; garden-grown, greenhouse-grown, and early market tomatoes; and home-canned, commercially canned, and frozen tomato juice.

**Recovery of vitamin C from the human bladder,** S. SHERRY and G. J. FRIEDMAN (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 3, pp. 707–709*).—By instilling known amounts of ascorbic acid into the bladders of patients with a very low blood serum ascorbic acid content, removing the urine by catheter at

varying intervals, and determining its ascorbic acid content, it was shown that no appreciable destruction of the vitamin occurs in the bladder. The recoveries amounted to from 92 to 107 percent on doses ranging from 0.5 to 30 mg.

**Relation between the vitamin C content of the blood and fever metabolism** [trans. title], F. X. HAUSBERGER and N. NEUENSCHWANDER-LEMMER (*Klin. Wchnschr., 18 (1939), No. 33, pp. 1119–1123, figs. 2*).—Using normal and sick subjects, numerous determinations were made of the change in vitamin C content of blood following the injection of the pure crystalline vitamin (10 mg. per kilogram). In normal subjects with blood not highly depleted in the vitamin, there followed a gradual decrease in the vitamin after injection, the decrease being dependent upon the time. In patients with diseases leading to febrile conditions and in those with original large vitamin C deficits, the decrease in the vitamin C content of the blood following injection was greatly accelerated. The rapid disappearance from the blood stream is caused by the rapid transfer to the impoverished tissues.

**The tissue content of highly unsaturated cephalin in C-avitaminosis** [trans. title], Y. SUEYOSHI and H. MICHIMOTO (*Jour. Biochem., 30 (1939), No. 1, pp. 155–157*).—Accepting Michimoto's[1] findings that cephalins with highly unsaturated fatty acid side chains were activators of blood coagulation, and using his method of determining them as the bromo derivatives, the present study was undertaken to determine these compounds in the tissues of normal and scorbutic guinea pigs. Much smaller amounts of bromocephalin were obtained from the tissues of scorbutic animals than from corresponding tissues of normal animals. This difference was especially marked in the blood vessels where only 10.8 mg. percent was found in scorbutic guinea pigs as compared with 631.8 mg. percent in normal animals. It is concluded, therefore, that this great deficiency of cephalins with unsaturated fatty acid side chains as activators of blood coagulation is responsible for the persistent bleeding in scorbutic guinea pigs.

**The retention of calcium by the rat in the presence and in the absence of vitamin C**, K. M. HENRY and S. K. KON (*Biochem. Jour., 33 (1939), No. 10, pp. 1652–1654*).—A basal diet, low in calcium (0.1561 percent), adequate in phosphorus (0.2413 percent), and devoid of vitamin C, was fed for 5 weeks to paired groups of young male rats, the one group receiving the basal diet and the other the basal diet plus a daily supplement of 2 mg. of ascorbic acid per rat. The calcium was mainly derived from $CaHPO_4.2H_2O$. The food intakes of paired groups were equalized.

Data on weight gains and on calcium and phosphorus balances show that both groups grew at the same rate and consumed 5.8 mg. of calcium and 10.5 mg. of phosphorus per gram of gain in weight. Calcium retentions amounted to 91.95 and 92.31 percent for the control and vitamin C groups, respectively; phosphorus retentions amounted to 44.25 and 42.98 percent, respectively. The differences were not statistically significant, and the findings, confirmed by carcass analyses, show no effect from the ascorbic acid on the retention of calcium with the type of diet used.

**Effects of vitamin C deficiency and diphtheria toxin on cellular blood constituents of guinea pig**, A. SIGAL (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 1, pp. 163–167*).—During studies of the effects of vitamin C depletion (E. S. R., 78, p. 136) and diphtheria toxin injections on glucose tolerance in guinea pigs, the author, with the assistance of S. Bailey, investigated the parallel changes in cellular blood constituents.

[1] Jour. Biochem., 30 (1939), No. 1, pp. 147–153.

The development of scurvy in the guinea pigs was accompanied by a decrease in hemoglobin and erythrocytes and a slight increase in leucocytes. Animals receiving 3 mg. of ascorbic acid daily and given subcutaneous injections of diphtheria toxin showed a moderate reduction in hemoglobin and erythrocytes and a moderate increase in leucocytes. With 0.5 mg. or no ascorbic acid and the same injections of toxin, the changes in blood constituents were more marked, and the differential counts showed an increase in polymorphonuclear leucocytes, a decrease in lymphocytes, and the presence of many nucleated red cells and abnormal cell forms. The animals receiving higher doses of ascorbic acid were able to withstand the effects of the toxin to a greater degree. It is thought, however, that the increased protection afforded by the higher vitamin intake is due to the general physiological benefits of a better state of nutrition rather than to a direct chemical inactivation of the toxin by the vitamin.

**The biological vitamin D assay of low-potency materials with special reference to the role of the mineral content of the diet**, N. T. GRIDGEMAN, H. LEES, and H. WILKINSON (*Biochem. Jour., 33 (1939), No. 5, pp. 645–654, fig. 1*).—In order to determine the best method of assaying the low-potency butters and margarines, a study was made of the effect, if any, of large quantities of dietary fat on the vitamin D therapy of rat rickets. In the studies described rats made rachitic by a 16- to 18-day period on a standard rachitogenic diet were dosed with equal quantities of vitamin D (0.5 International Unit per day) in conjunction with various levels of the standard rachitogenic salt mixture and in some cases with large quantities of fat. The salt mixture was composed of calcium carbonate 75 percent, sodium chloride 15, magnesium sulfate 7.5, ferric citrate 2.4, and potassium iodide 0.1 percent. Since phosphorus was furnished by the meat meal and the corn in the diet, any variation in the proportion of salt mixture affected the calcium : phosphorus ratios.

It was found that the presence of excess fat in the diet influenced the degree of calcification produced by the vitamin D only indirectly by lowering the consumption of salts. The healing produced by the vitamin D, as measured by the line test, was found to be inversely proportional to the intake of the salt mixture. A very low intake of the salt mixture through effecting a more favorable Ca : P ratio produced healing in the absence of vitamin D. For the experimental conditions described it was considered, therefore, that low-potency butters could be accurately tested only by equalization of the salt mixture intakes of the standard rats receiving the test substance.

**Effect of A. T. 10 (dihydrotachysterol) on various types of experimental rickets in rats**, A. T. SHOHL, C. H. FAN, and S. FARBER (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 2, pp. 529–534*).—Rats on a high calcium-low phosphorus diet (Ca : P ratio of 4.0 : 1) failed to receive protection against rickets even when the daily A. T. 10 supplement amounted to as much as ⅛ m. l. d., and the gains in weight were far less than those of normal controls. Rats on a low calcium-high phosphorus diet (Ca : P ratio of 0.05 : 1) receiving doses of 1/800, 1/80, and ⅛ m. l. d. in various groups showed progressively less rickets as the dose was increased and those receiving ⅛ m. l. d. showed absence of rickets. On this diet, the A. T. 10, like cod-liver oil, caused gains in weight. Administered as a curative supplement to rats that had developed rickets on the low calcium-high phosphorus diet, the A. T. 10 at the level of ⅛ m. l. d. daily caused healing to be far advanced in 7 days. The data presented show, however, that the effects of the A. T. 10 in the dosages used can be interpreted only by a study of the bone histology, since the roentgenograms, blood serum, and bone ash show but slight changes as compared with

negative controls maintained on the rachitic diet without supplement. This is in contrast with the animals, particularly those on the high calcium-low phosphorus diet, receiving cod-liver oil supplements (9 units of vitamin D daily), in which deposition of minerals was marked. The results indicate that A. T. 10 and vitamin D affect calcium and phosphorus metabolism to a different degree, and that the A. T. 10 is more effective in preventing rickets induced by the low calcium-high phosphorus diet because it facilitates the elimination of phosphate in the urine and hence renders this type of diet less rachitogenic.

**Effect of choleic acid of vitamin K on prothrombin levels of bile fistula rats,** E. T. Cohn and C. L. A. Schmidt. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 2, pp. 443, 444*).—The oral administration of the choleic acid of vitamin K to bile fistula rats in doses of 10–20 mg. per 100 gm. was found to produce an increase in the prothrombin value. At these doses, however, the prothrombin levels were still below normal.

**The hemoglobin synthesizing value of egg yolk** (*Kentucky Sta. Rpt. 1939, pt. 1, p. 24*).—In preliminary studies with several groups of children with subnormal hemoglobin and red blood cell count, it was found that the addition of ½ pt. of milk to the diet per day effected a definite improvement in hemoglobin and cell count, although only a subnormal plateau of hemoglobin was reached. Apparently, therefore, other deficiencies [notably protein] besides iron were present in the diets. Experiments are now in progress to determine the effect of adding egg yolk to the daily diet of the children lowest in hemoglobin in the groups examined.

**Valine and isovaleric acid show positive influence upon hemoglobin production in anemia due to blood loss,** F. S. Robscheit-Robbins and G. H. Whipple (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 2, pp. 361–363*).—In continuation of earlier studies on the effect of natural and synthetic amino acids on hemoglobin regeneration in dogs (E. S. R., 78, p. 574), the authors have demonstrated that the anemic dog can use valine, in both the naturally occurring form and its optical isomer, and at times the related fatty acid, isovaleric acid, in building new hemoglobin. It is suggested that occasional failures to utilize the specific amino acid are due to the unavailability at that particular time of one or more of the many supplements, which must be derived from the food intake, or body stores, or protein catabolism.

**Effect of fluorine on solubility of enamel and dentin,** J. F. Volker (*Soc. Expt. Biol. and Med. Proc., 42 (1939), No. 3, pp. 725–727, fig. 1*).—To determine whether fluorine is able to combine with the mineral substance of teeth as it does with bone and calcium phosphate, for example, human enamel and dentin, powdered to pass a 100-mesh screen and separated and purified by centrifugal flotation, were each suspended in 500-mg. amounts in 250-cc. portions of sodium fluoride solutions and shaken for 1 hr. The recovered samples, thoroughly washed, were compared with untreated control samples as to the weight losses sustained by 50-mg. portions after 1 hr. in 20 cc. of a 0.2 M acetic acid-sodium acetate buffer at pH 4.0. "Of enamel samples washed with 1:25, 1:100, 1:1,000, and 1:10,000 sodium fluoride solutions, averages of 13.2, 14.1, 15.6, and 18.5 mg., respectively, dissolved as compared with an average of 27.3 mg. for untreated samples. Normal dentin and dentin treated with 1:1,000 sodium fluoride lost 36.1 and 26.0 mg., respectively." Confirmatory figures were obtained in other tests using decalcification periods of different lengths. Five- to 10-min. applications of the fluoride reduced the solubility almost as effectively as the 1-hr. treatment. The diminished solubility of the enamel was not affected by washing in water or saliva for periods up to 70 hr. The natural surfaces of whole teeth treated with sodium fluoride were much less affected by acid

than those of untreated teeth. These observations indicate that fluorine reacts with tooth substance to produce a less soluble product.

**Xylose as a cataractogenic agent,** W. J. Darby and P. L. Day. (Univ. Ark.). (*Soc. Expt. Biol. and Med. Proc., 41 (1939), No. 2, pp. 507, 508*).—In this preliminary report it is announced that xylose in 35 percent concentration has been found as effective as galactose in producing in young rats the type of cataract attributed by Mitchell and associates (E. S. R., 78, p. 571) to galactose. "It is suggested that the cataractogenic activity of sugars may be dependent upon certain molecular configurations."

## TEXTILES AND CLOTHING

**Structure of the rayon fibre,** H. Mark (*Nature [London], 144 (1939), No. 3642, pp. 313, 314, figs. 9*).—A series of 9 illustrations representing decreasing magnifications is presented to convey a picture of the structure of the rayon fiber. The first of these depicts the molecular configuration of the fundamental chemical unit, the glucose molecule; the second, the crystallographic unit of the fiber, namely the elementary cell of the cellulose lattice, as revealed by X-ray investigations; the third, the micellar structure, showing that the fiber is differentiated into crystallographic and amorphous parts; and fourth, the fringe and net structure of the cellulose. These 4 pictures represent theoretical magnifications of 50,000,000 down to 50,000. At a magnification of 5,000, the utmost limit of normal microscopic resolving power, the picture shows the fibrillar structure of the fiber in which the morphological units are visible. The next pictures at magnifications of 500 (the maximum under normal light) and 50 show the viscose rayon thread; and the last 2 pictures, with a magnification of 5 and 1, respectively, show the familiar aspect of an artificial silk yarn. The significance of the various structural units depicted is discussed briefly.

**Viscose rayon: Stress-strain properties.—I, Effect of specimen length,** H. R. Bellinson (*Textile Res., 10 (1940), No. 7, pp. 287–297, figs. 3*).—This report is the first in an investigation of the effects of testing conditions on the load-stretch properties of viscose rayon.

The apparatus, an inclined-plane testing machine, is illustrated by a diagram and described. The tests were performed on viscose rayon yarn 150/42, and 48 specimens, representing 12 taken at random from each of 4 skeins, were tested at 5, 10, 15, and 20 in. for average breaking strength and percentage of stretch. Averages of 274.32 gm., 271.02, 270.77, and 271.49 gm. were reported for those four lengths and the percentage stretch as 24.31, 23.45, 22.83, and 22.51.

The decrease in breaking strength with longer length is explained by the fact that the number of weak points in a yarn will increase as the test length is increased; and as the number of weak points increases the probability that a very weak place will be present also increases. As a result the longer specimens may break at a lesser load, and the breaking strength of long specimens will be less than that of shorter ones. Increase in length was found to produce an apparent decrease in the percentage breaking strength. This is probably the result of a jaw effect in that some extension of the portion of the yarn gripped by the jaws may occur.

**Compare glass curtain fabrics** (*Ohio Sta. Bul. 600 (1939), p. 59*).—This progress report of a study of the selection and care of cotton and rayon glass curtain fabrics lists those being studied and the laboratory tests used.

***Comparison of the accuracy of two methods of estimating fineness of* wool fibers,** R. W. Phillips, R. G. Schott, J. I. Hardy, and H. W. Wolf. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 5, pp. 343–349, fig. 1*).—

In comparing the accuracy of two methods for estimating diameters of wool fibers (E. S. R., 83, p. 141), in method A diameters of cross sections of 100 wool samples, after projection to 1,000 diameters, were estimated by comparing with a standard set of known diameters enlarged to the same magnitude, while in method B diameters of wool fibers from the same 100 samples were estimated by comparing with a standard set of wool samples of known diameters. By method A, 45 of 100 samples were placed correctly, based on the average scores for judges, and only 4 deviated as much as 2 classes from the actual measurements. By method B only 13 samples were placed correctly, and 6 samples deviated 4 classes from the classes in which they were placed by direct measurements. Judges tended to underestimate diameter by method A and to overestimate by method B. Analysis of variance showed that 82.3 percent of the variance in scores obtained by method A was due to differences among wool samples, and only 70.7 percent in method B. Intraclass correlations between scores of samples on different days, between scores of the same judge on different days, and between scores of the same sample by different judges were all highly significant for both methods. Indications were that use of method A results in estimates of fiber diameters nearer the actual measurements, and that this method is more desirable than method B in all types of work in which detection of small differences in fiber size is essential.

**The provision and use of household textiles by farm families,** M. E. Frayser (*South Carolina Sta. Rpt. 1939, pp. 24–26*).—A brief summary of the results of a study previously noted as in progress (E. S. R., 81, p. 155).

## MISCELLANEOUS

**Report of the Hawaii Agricultural Experiment Station, 1939,** [J. H. Beaumont et al.] (*Hawaii Sta. Rpt. 1939, pp. 89, figs. 13*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

**Fifty-second Annual Report [of Kentucky Station], 1939, I, II,** T. P. Cooper et al. (*Kentucky Sta. Rpt. 1939, pts. 1, pp. 63; 2, pp. [2]+393+4, figs. 82*).—Part 1 includes the report of the director, the experimental work not previously noted being for the most part abstracted elsewhere in this issue. Part 2 contains reprints of Bulletins 389–397 and Circular 50, previously noted.

**Annual Report of [Nevada Station], 1939,** S. B. Doten et al. (*Nevada Sta. Rpt. 1939, pp. 46, figs. 5*).—Following a discussion of station policy, experimental work for the most part noted elsewhere in this issue is briefly described.

**Progress of agricultural research in Ohio: Fifty-seventh Annual Report of [Ohio Station], 1938,** E. Secrest (*Ohio Sta. Bul. 600 (1939), pp. 90, figs. 34*).—The experimental work reported not previously referred to is for the most part noted elsewhere in this issue.

**Fifty-second Annual Report of the South Carolina Experiment Station, [1939],** H. P. Cooper et al. (*South Carolina Sta. Rpt. 1939, pp. 199, figs. 30*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

**Fifty-first Annual Report [of Tennessee Station], 1938,** [C. A. Mooers et al.] (*Tennessee Sta. Rpt. 1938, pp. 94, figs. 18*).—The experimental work reported is for the most part noted elsewhere in this issue.

**Forty-ninth Annual Report of [Wyoming Station, 1939],** J. A. Hill (*Wyoming Sta. Rpt. 1939, pp. 47*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

# NOTES

**Colorado College and Station.**—The resignations are noted of Dr. C. Guinn Barr, associate in botany; Carl H. Metzger, associate in horticulture, to assume charge of a potato improvement program in Kern County, Calif.; Drs. Frank Thorpe, Jr., and Herbert W. Reuszer as associates in pathology and bacteriology; and J. Karl Lee as assistant professor and assistant in economics. Recent appointments include Dr. M. E. Paddick as assistant in botany; Dr. J. G. McLean as associate in horticulture; Dr. Hilton A. Smith as associate professor of pathology; and Dr. Thomas D. Kroner as assistant bacteriologist.

**North Carolina College and Station.**—Robert M. Salter, associate director and chief in agronomy of the Ohio Station and chairman of the department of agronomy at Ohio State University, has been appointed director of the station, effective October 1. Dr. L. D. Baver, associate in agronomy in the Ohio Station and professor of agronomy in Ohio State University, has been appointed associate director. Dr. C. Horace Hamilton, head of the section of community organization and in charge of the section of community organization and change of the U. S. D. A. Bureau of Agricultural Economics, has been appointed head of the department of rural sociology, which was separated on September 16 from the department of agricultural economics.

**Ohio State University.**—Chester O. Reed, associate in agricultural engineering in the station since 1922 and professor of agricultural engineering in the university, died June 11 at the age of 54 years.

**South Dakota College and Station.**—Dr. G. L. Brown, dean of the faculty and acting president for the past year, as well as on several other occasions, has been appointed president following the retirement of President C. W. Pugsley because of illness. Drs. L. D. Hiner, pharmacologist, and R. L. Woolbert, assistant professor of sociology and assistant sociologist, have resigned and have been succeeded by Dr. Raymond P. Ahlquist and Walter L. Slocum, respectively. Other appointments include Dr. W. F. Buchholtz as plant pathologist, Dr. Harlan D. Anderson as associate agricultural economist, Guilford C. Gross as pharmaceutical chemist, and Alvin E. Coons and Gerald E. Korzan as assistant economists.

**Texas Station.**—C. H. McDowell, joint superintendent for the station and the U. S. D. A. Soil Conservation Service of the Blackland Substation, has been appointed vice director and agronomist of the station, effective September 1, vice Dr. Paul C. Mangelsdorf, resigned to become professor of economic botany and assistant director of the Botanical Museum of Harvard University. H. O. Hill, project supervisor of the Soil Conservation Service at the Blackland Substation, has been appointed joint superintendent. Byron C. Langley, agronomist in soil and water conservation investigations at the Spur Substation, has been appointed superintendent of the substation (No. 20) recently established at Stephenville to serve the West Cross Timbers region of the State.

**Virginia Polytechnic Institute and Station.**—Ten buildings constructed or remodeled during the past 2 years with P. W. A. and W. P. A. aid were dedicated on July 30. Among them were two units of the agricultural building, an agricultural engineering laboratory, and a home economics building.

A ninth substation was authorized by the 1940 legislature, which appropriated $6,460 for the purchase of land and the construction of buildings and $3,900 per annum for the current biennium for maintenance. This substation is designed to study forage and other farm crops in northern Virginia. A tract of 43 acres near Orange has been selected as its site.

Edmund C. Magill, associated with the institution since 1918 and professor of agricultural education since 1924, died June 20 at the age of 50 years.

Appointments effective July 1 included Dr. H. M. Love as agricultural economist and the following assistants: E. H. Glass, entomology; J. B. Elrod, agricultural engineering; L. I. Miller, plant pathology; and C. E. Addy, biology. Mary S. Eheart, associate home economist, has been transferred to the instruction staff for full-time teaching.

**Necrology.**—Hon. David F. Houston, Secretary of Agriculture from 1913 to 1920, died in New York City September 2 at the age of 74 years. A native of North Carolina and a graduate of the University of South Carolina in 1887, he received the M. S. degree from Harvard University in 1892 and later honorary degrees from several institutions. He was president of the Texas College from 1902 to 1905, the University of Texas from 1905 to 1908, and chancellor of Washington University of St. Louis from 1908 to 1913. His service with the Department of Agriculture covered the World War period. He was widely recognized as an authority on financial matters, serving as chairman of the Federal Reserve Board and the Federal Farm Loan Board, as Secretary of the Treasury from 1920 to 1921, and subsequently with several large corporations with headquarters in New York City.

Dr. Lee Cleveland Corbett, prominently associated with the horticultural work of the U. S. Department of Agriculture from 1901 till his retirement as principal horticulturist in 1938, died July 13 at the age of 72 years. A native of New York and a graduate of Cornell University in 1890, he received the M. S. degree from the same institution in 1896 and an honorary degree of doctor of agriculture from the University of Maryland in 1921. Dr. Corbett was assistant horticulturist at the Cornell Station from 1891 to 1893, professor of horticulture and forestry at the South Dakota College in 1893–95 and the West Virginia University in 1895–1901, and horticulturist in the respective stations. While with the Department he developed the Arlington (Va.) Farm for experimental purposes, served as administrative head of the horticultural work of the Bureau of Plant Industry for many years and as Assistant Chief of the Bureau from 1913 to 1915, and for the decade beginning with 1928 was engaged mainly in research into the causes leading to the development of horticultural industries in particular areas and their subsequent history. Besides numerous station and Department bulletins and articles, he was the author of Garden Farming (1913) and Intensive Agriculture (1913).

Nils Andreas Olsen, Chief of the U. S. D. A. Bureau of Agricultural Economics from 1928 to his resignation in 1935, died in Bronxville, N. Y., on July 28 at the age of 53 years. A native of Illinois and a graduate of Luther College, Iowa, in 1907, he received A. M. degrees from the University of Wisconsin in 1909 and from Harvard University in 1912. He was instructor in history and economics at Muhlenberg College in 1909–10 and assistant in history at Harvard University in 1910–12; from 1912 to 1919 he managed several farms. Entering the Department of Agriculture in 1919 as an assistant agricultural economist, Mr. Olsen became Assistant Chief of the Bureau in 1925 and Chief 3 years later. A tribute by ex-Secretary Wallace states that he was "one of the strong leaders who made the Bureau of Agricultural Economics the outstanding research institution which it is today."

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# EXPERIMENT STATION RECORD

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## THE DEPARTMENT OF AGRICULTURE APPROPRIATION ACT, 1941

In 1891, the year for which the *Record* began its analysis of the annual appropriation acts for the support of the Department, the total appropriations were $3,028,153.80. For the fiscal year ended June 30, 1941, the appropriations and reappropriations thus far provided aggregate $1,220,239,732.

The latest act was signed by President Franklin D. Roosevelt on June 25, 1940, and became effective on July 1. As in 1939, it was immediately modified by reorganization changes affecting the Department, notably the transfer of the Weather Bureau and the Food and Drug Administration to the Commerce Department and the Federal Security Agency, respectively, under the terms of the President's Reorganization Plan No. IV. The total amount transferred from the Department to other agencies was $11,372,221.

Supplementary legislation in other acts also became effective, and the sum eventually available to the Department as at present constituted through the act itself will be $907,264,838 as compared with $1,030,698,141 for the fiscal year 1940. Reappropriations have brought $67,946,161 additional, deficiency acts $20,537,000, the so-called permanent appropriations $107,447,024, the Emergency Relief Act $108,992,084, and trust funds, service charges, and flood control grants transferred from the War Department $8,052,625. In addition, Reconstruction Finance Corporation loans up to $100,000,000 for rural electrification, $125,000,000 for rural rehabilitation, and $50,000,000 for tenant purchases will be available in connection with Department programs for which funds for similar loans were included in the Department's total appropriation last year. When these recoverable items are taken into account, the aggregate for 1941 becomes $1,495,239,732. This is an increase of $716,076 over the comparable total for 1940.

The action programs of the Department account for $1,116,853,822 of its total funds. One of the largest items in the new act is $458,554,297 (including $19,997,557 reappropriated) for the agricultural conservation program as authorized by the Agricultural Adjustment

Act of 1938. The corresponding figure for 1940 was $559,556,740. Other large items of appropriation and reappropriation are $212,-000,000 for parity payments to producers of wheat, cotton, corn, rice, and tobacco; $235,924,611 for the disposal of surplus commodities, an increase of $30,247,047; and $47,975,000 for payments and administration under the Sugar Act of 1937. The Farm Credit Administration is granted $41,344,394, a decrease from $48,420,029, which is due largely to the fact that a direct appropriation of $15,000,000 for emergency crop and feed loans was not repeated. For administrative expenses the Rural Electrification Administration receives $3,650,425, an increase from $2,698,425, and the Commodity Credit Corporation $2,000,000. Under the Water Facilities Act of 1937, $500,000 is again available.

The Special Research Fund of the Department under the Bankhead-Jones Act (E. S. R., 73, p. 289) is again maintained at the $1,400,000 level. The four regional research laboratories (E. S. R., 80, p. 289) authorized by the Agricultural Adjustment Act of 1938 were limited to not to exceed $3,000,000, a reduction of $200,000 from the previous year. It is estimated that the funds available for laboratory operation and research will approximate $1,600,000. It is expected that all the laboratories will be completed by the beginning of the calendar year 1941 at a cost of about $5,700,000 for construction and $1,775,000 for equipment.

Under the Office of Experiment Stations a total of $7,107,235 is granted, of which $6,862,500 represents payments to the States, Hawaii, Alaska, and Puerto Rico for agricultural experiment stations. This is an increase of $13,750 in the payments to Hawaii, Alaska, and Puerto Rico. For the administrative expenses of the Office, a total of $189,735 (including an allotment of $28,000 from the Special Research Fund) will again be available, as will also be the sum of $83,000 for the maintenance of the Federal Experiment Station in Puerto Rico.

The funds administered by the Extension Service are decreased from $19,320,549 to $19,288,083. The amount available for payments to the States and Territories in the fiscal year 1941 is $13,796,918 (plus the permanent Smith-Lever Act appropriations of $4,701,165), which provides a net increase over 1940 of $27,500 in the funds for Alaska and Puerto Rico. The allotment for administration and coordination of extension work is diminished from $586,416 to $550,000, and that for extension information from $263,550 to $240,000.

A decrease from $16,663,712 to $12,449,340 in direct appropriations available for the Bureau of Animal Industry is largely attributable to a reduction in the direct appropriation for eradicating tuberculosis and Bang's disease from $8,300,000 to $4,300,000; in those for eradicating cattle ticks from $475,000 to $325,000; in hog cholera control from

$122,000 to $112,728; and for inspection and quarantine work from $680,000 to $603,500. These reductions reflect the progress being made in overcoming the major animal diseases. On the other hand, the allotment for animal husbandry investigations is increased from $802,880 to $824,380 to develop, in cooperation with the Forest Service, the raising of beef cattle, primarily for local consumption, in the Southeastern States cutover regions.

The total for the Bureau of Plant Industry carried by the act shows a reduction from $5,415,509 to $5,171,455, but this does not take account of deficiency act appropriations of $7,000 for continuation of the U. S. Yuma Field Station at Bard, Calif., and $500,000 for new investigations directed toward the development of rubber production in the Western Hemisphere. The rubber investigations may include production, breeding and disease research, surveys of potential rubber-producing areas, and the establishment and operation of experiment and demonstration stations in suitable locations, and the appropriation is made available to other Government agencies cooperating or assisting. The reductions in the Bureau's funds are divided among 12 of the 24 major subdivisions of its work, with the largest decreases those of $51,121 for investigations of cereal crops and diseases and $48,982 for fruit and vegetable crops and diseases. Among the items which continue unchanged is that of $226,828 for dry-land agriculture studies. There is an increase of $15,000 for fertilizer investigations, a project transferred to the Bureau from the Bureau of Agricultural Chemistry and Engineering.

The Forest Service is granted a total of $19,632,955 in addition to $9,000,000 (a reduction of $1,000,000) for the construction of forest roads and trails and $400,000 (a decrease of $77,898) for cooperative farm forestry. A net reduction from the previous year of $2,498,431 (leaving out of consideration supplemental appropriations) is a resultant mainly of decreases from $3,000,000 to $1,000,000 in the funds for acquisition of lands for national forests, from $12,002,400 to $11,500,000 for national forest administration and from $643,403 to $605,000 for forest management studies. A new item is the allotment of $300,000 for clean-up work in connection with the New England hurricane of 1938.

The appropriations for the Bureau of Agricultural Chemistry and Engineering are curtailed from $1,145,169 to $905,225. Its funds for agricultural chemical investigations are reduced from $411,500 to $379,606, agricultural engineering investigations from $349,469 to $304,469 (by the elimination of dust explosion studies), and for studies of the industrial utilization of farm products and byproducts from $189,600 to $22,550 in the expectation that most of these investigations will be taken over by the four regional research laboratories.

An increase of $4,000 is accorded the Bureau for its naval-stores investigations.

The act appropriates $5,732,917 for the Bureau of Entomology and Plant Quarantine, an apparent reduction from $6,199,509. There are, however, supplementary appropriations in deficiency acts which provide $3,300,000 additional for the fiscal years 1940 and 1941 for the control of incipient and emergency outbreaks of insect pests and plant diseases, such as grasshoppers, mormon crickets, and the white-fringed beetle, and $30,000 additional for Japanese beetle control. The 1941 allotments for most of the Bureau projects are continued unchanged, the chief differences being in those for Dutch elm disease eradication, reduced from $500,000 to $400,000; combating of forest insects, reduced from $253,100 to $212,500; blister rust control, increased from $300,000 to $400,000; and pink bollworm and Thurberia weevil control, reduced from $909,608 to $526,800.

The Agricultural Marketing Service receives $6,297,808, a decrease from $6,347,070. Many of its allotments are modified, the most significant including increases of $32,500 and $22,707 for the administration of the U. S. Warehouse and the Federal Seed Acts and reductions of $22,510 and $31,470 in the funds for crop and livestock estimates and the marketing of farm products.

The appropriations of the Soil Conservation Service were reduced from $21,422,374 to $18,792,540. Of this reduction, $131,185 is in the allotment for soil and moisture conservation and land-use investigations and $2,496,599 in that for soil and moisture conservation operations, demonstrations, and information.

The remaining work of the Department is provided for much as at present. The Bureau of Agricultural Economics receives a decrease of $64,100 in its funds for economic investigations, the Commodity Exchange Administration a decrease of $48,380, the Bureau of Dairy Industry an increase of $10,000 for dairy investigations, the Bureau of Home Economics a decrease of $2,040, the Library a decrease of $2,970, and the Beltsville Research Center an increase of $1,620, making their new allotments $863,900, $575,000, $731,305, $323,045, $102,000, and $86,620. The Office of Foreign Agricultural Relations is continued at $196,396. The Secretary's Office is granted $826,427, the Office of the Solicitor $206,355, and the Office of Information $1,917,994, of which $1,573,111 (a reduction of $16,435) is for the printing and binding of the Department.

# RECENT WORK IN AGRICULTURAL SCIENCE

## AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[**Chemical investigations at the Florida Station**] (*Florida Sta. Rpt. 1939, pp. 83, 84, 85, 86*).—These have included a study of the chemical composition of the ash of Florida fruits and vegetables with reference to the more unusual constituents, by L. W. Gaddum and L. H. Rogers; the development of quantitative spectrographic methods for agricultural research, by Gaddum, Rogers, and R. A. Carrigan; and mineral content of vegetable crops with special reference to iron, by H. W. Winsor.

[**Chemical investigations at the Puerto Rico College Station**] (*Puerto Rico Col. Sta. Rpt. 1939, pp. 37–45, figs. 3*).—The following topics are dealt with briefly: The Birectifier in rum manufacture, by R. Arroyo, F. Marrero, and L. Igaravídez; radiant energy from bacterial cells new factor in symbiotic phenomena, and the natural rum aroma, both by Arroyo; rum types greatly modified through variations in fermentation technic—creation of new types also possible, by Arroyo, Marrero, and Igaravídez; prospects on the establishment of cellulose industry in Puerto Rico look very favorable, by Arroyo and V. L. Quiñones; studies on the possibilities of industrial utilization of the coconut, by J. H. Ramírez; and cassava bread, by H. E. Cruz Monclova.

***Colorimetric method for determination of barium***, H. A. Frediani and B. J. Babler. (La. State Univ.). (*Indus. and Engin. Chem., Analyt. Ed., 11 (1939), No. 9, pp. 487–489, fig. 1*).—Barium may be rapidly determined by precipitating as the chromate, dissolving in hydrochloric or nitric acid, and comparing the resultant solution with a colorimetric standard. In analyzing a solid sample containing barium a sufficient weight of sample should be taken to yield a final solution (for comparison) containing from 0.2 to 1 mg. of barium per cubic centimeter of solution. Though such filters were not available for accurate trial, it is believed that the use of green and blue filters may extend these limits. For the lower concentrations, heights of 30 mm. in the colorimeter yield most consistent results, while for the higher concentrations heights of 15 and 20 mm. are recommended.

The presence of strontium ion leads to erroneously high results. Its effect may be obviated, as in the gravimetric method, by careful double precipitation. The presence of sodium, potassium, calcium, and magnesium ions in equivalent amounts does not affect the determination of barium. The concentration of acid used to effect solution is not critical.

**A study of gluten protein fractionation from sodium salicylate solution, II–IV.** (N. Dak. Expt. Sta.). (*Cereal Chem., 15 (1938), No. 1, pp. 80–90; 16 (1939), Nos. 1, pp. 78–88; 2, pp. 279–289*).—These three papers cover further applications of the sodium salicylate dispersion method as used by the author in the first contribution of this series (E. S. R., 78, p. 441).

II. *Bread wheat gluten fractionation*, R. H. Harris.—A series of 30 samples of flour experimentally milled to a 70-percent extraction from hard red spring

wheat was analyzed for crude flour protein, ash, moisture, and wet crude gluten content. The gluten nitrogen was determined and the protein in the gluten computed. The flours were also baked by the standard A. A. C. C. method using 5 percent of sucrose. The glutens washed from the flours were then dispersed in 10 percent sodium salicylate solution, and fractionated by successive additions of 3, 8, and 10 cc. of magnesium sulfate solution. The first fraction was highly correlated with loaf volume. The remaining two fractions had little relationship with flour strength. Crude flour protein was not related to loaf volume, but the percentage of wet crude gluten and gluten protein were positively correlated with this variable. The same relationship was also apparent between total protein removed by magnesium sulfate and loaf volume. A smaller correlation coefficient between loaf volume and the total quantity of protein dispersed by sodium salicylate solution was found. The proportion of total protein removed from the salicylate dispersion appeared to vary with the solubility of the gluten in the dispersion medium. The first magnesium sulfate precipitate gave more information with respect to loaf volume than did wet crude gluten content.

A comparison between hard red spring and durum wheats showed the crude protein content of wheat and flour to be higher for the durums. The durum as a class had a smaller quantity of protein in the first fraction. This difference was less for fraction 2, and in the final fraction the hard red spring varieties had less protein precipitated. Both total protein removed and protein solubility are lower in durum wheat than in the hard red spring varieties. In similar work on 6 flours milled from a sample of hard red spring wheat to approach as closely as feasible to commercial millstreams the first protein fraction isolated appeared to vary among the different flours, the sample baking into the best loaf having the largest quantity of protein precipitated, while the poorest quality flour had the smallest proportion of protein thrown down. The fractions from the other flour samples varied between the 2 limit values. The 6 flours described appeared to approach quite closely to corresponding commercial samples in their chemical characteristics.

III. *The effect of proteolytic enzymes*, R. H. Harris.—Proteolytic enzymes added to dough may profoundly affect the relative distribution of the gluten protein fractionated from the washed-gluten dispersion of such doughs. Marked dissimilarities among different enzymes are shown. Papain, malt diastase, and takadiastase show evidences of a disruptive action upon the gluten complex, causing the formation of smaller protein particles in the dispersion, with consequent shifts in the quantities of protein contained in the various fractions. Flour proteases, when activated by glutathione in concentrations present in the yeast water used in this work, appear to coagulate rather than disperse the gluten complex. Pancreatin may have a similar effect when present in moderate quantities.

IV. *Effect of proteolytic enzymes, as influenced by class of wheat*, R. H. Harris and J. Johnson, Jr.—Four flours milled from hard red spring, hard red winter, soft red winter, and durum wheat were analyzed for ash, total protein, and dry crude gluten and were mixed into doughs in the customary manner, with the exception that appropriate concentrations of papain, pancreatin, and yeast water were incorporated in the dough mix in all except the control doughs. The gluten was washed from these doughs immediately after mixing, and the percentages of gluten moisture and dry crude gluten were determined. A portion of the wet crude gluten was dispersed in 10 percent sodium salicylate solution, and the final concentration of dispersed gluten protein determined. The dispersed protein was then fractionally precipitated by successive additions of magnesium sulfate solution and the quantity of protein determined in each fraction.

The proteolytic enzymes affected the relative distribution of the protein fractions in different classes of wheat flour in the same general manner. The first fraction was progressively reduced in quantity as the concentration of enzyme increased. The second fraction decreased as the severity of the treatment was increased. The quantity of protein removed in fraction 3 was augmented by this treatment.

The effect of papain and pancreatin upon the proportion of gluten protein contained in fraction 1 differed somewhat among the 4 samples of wheat flour included in this study. Hard red spring wheat gluten when dispersed in sodium salicylate apparently lost the largest quantity of protein from fraction 1 following the addition of substantial quantities of enzyme to the doughs. Hard winter wheat glutens have the least removed, although the soft winter results were quite close to the hard winter. The durum wheat gluten approached closest to the hard red spring in quantity of gluten in this fraction.

**Effects of low topping and diastatic malt extract on composition and quality of sorgo sirup,** C. F. WALTON, JR., E. K. VENTRE, and S. BYALL. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *60* (*1940*), *No. 6*, *pp. 427–432*).—Sirups made from whole and from topped stalks of eight varieties of sorgo and from tops alone were compared with sirups made by modifications of this procedure, special attention being given to the use of starch-hydrolyzing enzymes. The topped stalks consistently produced sirup of better quality than the whole stalks, which, in turn, gave better sirup than did the tops alone.

Relatively little improvement in quality resulted from simply allowing the semisirup to settle, without malt-extract treatment, before completing the evaporation. All sirups produced by the process in which malt extract of high-diastatic power was used were of better color, flavor, and clarity than the sirups made from corresponding parts of the stalk by the standard procedure. The sirups of the highest quality were produced by using starch-hydrolyzing enzymes to supplement suitable topping.

**Soybean amylase.—I, The concentration and characterization of soybean amylase,** J. M. NEWTON and N. M. NAYLOR. (Iowa State Col.). (*Cereal Chem.*, *16* (*1939*), *No. 1*, *pp. 71–78*, *fig. 1*).—Methods for determining the saccharogenic power of soybeans and soybean-amylase concentrates and for preparing amylase concentrates from soybeans are given. The analytical methods are shown to be adaptable to the same determination in other seeds. The amylase content of soybeans was found to decrease slightly during germination. Characterization by various methods indicated that the concentrates contain principally $\beta$-amylase.

**Dextrose in the preserving industry,** E. H. WIEGAND. (Oreg. State Col.). (*Canner*, *90* (*1940*), *Nos. 10*, *pp. 12*, *13*, *18*; *11*, *pp. 26*, *27*, *32*).—Advantages in commercial canning practice gained by using dextrose in place of a part of the sucrose are pointed out, together with the fact that crystallized dextrose of high purity and uniformity of properties is now available for commercial processes.

**Tartar emetic on leaf and fruit surfaces: Distributional and semi-quantitative analysis, using an iodine-starch paper,** D. STARR. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, *11* (*1939*), *No. 9*, *pp. 519–521*, *figs. 2*).—The iodine-starch paper used was dark blue or brown, and the reaction with tartar emetic reduced the iodine and whitened the paper. A semiquantitative estimation of the tartar emetic was made possible by preparing, as a standard of comparison, small slips of paper containing a known quantity of tartar emetic on the surface. The tartar emetic paper and the citrus leaves were tested with the same iodine-starch paper, and by roughly integrating and comparing the whitened area due to the standard with that due to the unknown the approximate quantities of tartar emetic on the citrus leaves were obtained. The test may

also be used for roughly estimating tartar emetic residues on citrus fruit surfaces. The test was found sensitive to 0.9 μg. per square centimeter. Substances that reduce iodine interfered with the test. Some other interfering substances are noted.

**Determination of small amounts of copper in spray residues, D. E. H. Frear.** (Pa. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 11 (1939), No. 9, pp. 494, 495, fig. 1*).—Two methods for rapid determination of copper on surfaces sprayed with insecticide or fungicide mixtures are presented. The first, for quantities greater than 2 mg., is a modification of the usual procedure of weighing the metal directly after electrodeposition. The second, for smaller quantities of copper, is based on the photoelectric measurement of the color produced by sodium diethyl dithiocarbamate.

**The organic acids of rhubarb (Rheum hybridum).—III, The behavior of the organic acids during culture of excised leaves,** G. W. Pucher, A. J. Wakeman, and H. B. Vickery. (Conn. [New Haven] Expt. Sta. et al.). (*Jour. Biol. Chem., 126 (1938), No. 1, pp. 43–54*).—A further extension of this study (E. S. R., 78, p. 748) has shown that the organic acids of rhubarb leaves diminish during water culture in darkness, and evidence is presented that the change is due to respiration of a large part of the malic acid in the petiole. Water culture in light brings about a temporary increase in the organic acids in the petiole, which is shown to be due to an increase in malic acid. Culture in glucose solution in darkness brings about a similar but more prolonged and even more extensive change, and the evidence is clear that the newly formed malic acid arises directly or indirectly from the carbohydrate.

The organic acid metabolism of rhubarb leaves differs fundamentally from that of tobacco leaves during culture under similar conditions, and the behavior of the malic acid in both differs from its behavior in succulent plants. Accordingly, generalizations upon the chemical relationships of malic acid in green leaves are difficult. Neither citric nor oxalic acid appears to be extensively involved in the chemical changes of the organic acids of excised rhubarb leaves during culture, and the acids of the so-called unknown group were likewise but little involved. No evidence was found to link any of these acids with protein metabolism.

**The distribution of uncombined hexosamine in pineapple plants supplied either with ammonium sulfate or calcium nitrate salts, C. P. Sideris, H. Y. Young, and B. H. Krauss.** (Hawaii. Pineapple Prod. Expt. Sta.). (*Jour. Biol. Chem., 126 (1938), No. 1, pp. 233–239*).—Possible interference by glycine and lysine in hexosamine determinations was indicated. A modification limiting the time to 20 min. between heating and reading the color value in a Pulfrich photometer was necessary because it was found that with longer time intervals reducing sugars (2 mg. per cubic centimeter) interfered with the accuracy of the method.

Hexosamine was present in considerably greater quantities in the advanced and mature leaves of plants supplied with ammonium sulfate than in those of plants supplied with calcium nitrate. In the active and young leaves of both lots of plants the hexosamine contents were approximately the same.

**Silicotungstic acid determination of nicotine: Errors involved and a new technique for steam-distillation of nicotine, A. W. Avens and G. W. Pearce.** (N. Y. State Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 11 (1939), No. 9, pp. 505–508, fig. 1*).—The authors show that, although variations in solubility of nicotine silicotungstate with changes in acid concentration of the precipitating medium are insignificant for any but microdeterminations, there is a retention of silicotungstic acid by the filter paper such that when a highly

refined determination of the absolute amount of nicotine in a given material is desired, it becomes essential to estimate and correct for this error. Low results may also be obtained in the determination of nicotine, because the solubility of nicotine silicotungstate varies directly with temperature. For best results one should allow the nicotine silicotungstate precipitate to stand overnight at 0°–10° C. before filtering. Better crystallization is effected if the mixture is placed on the steam bath for a short time before holding at the lower temperature. The main revision of the method, however, consisted in the device of a new and less cumbersome distillation apparatus and distillation technic, reducing the volume required to be distilled from 1,000 or 1,500 cc. to about 100 cc. A steam pressure of 456–608 kg. per square meter throughout the run is specified. The new apparatus not only proved to be timesaving but seemed to give more consistent results.

**Estimation of gossypol in crude cottonseed oil,** F. H. SMITH and J. O. HALVERSON. (N. C. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 11 (1939), No. 9, p. 475*).—The assumption that, in precipitating dianilinogossypol with aniline with the aid of pyridine, pure dianilinogossypol can be obtained is stated to be invalid, the gossypol complex crystallizing out with 2 molecules of pyridine to 1 of the complex. The pyridine could be driven off by heating to constant weight, a process requiring from 18 to 24 hours' heating at 110° C. The time needed depended on the quantity of precipitate. Attempts to weigh the dipyridine compound were not accurate because of loss of a part of the pyridine in washing and drying the precipitate.

**Hemicelluloses from cottonseed hulls,** E. ANDERSON, J. HECHTMAN, and M. SEELEY. (Univ. Ariz. et al.). (*Jour. Biol. Chem., 126 (1938), No. 1, pp. 175–179*).—The authors obtained perfectly white hemicelluloses from cottonseed hulls. The analyses and specific rotations of these substances are given. They were found to be polyuronides of *d*-glucuronic acid and *d*-xylose in which 1 molecule of the acid is combined with from ± 10–16 molecules of the sugar.

**Studies in the synthesis of the antirachitic vitamins.—I, The synthesis of 3-[2′-methylenecyclohexylidene-1′]-propene-1,** N. A. MILAS and W. L. ALDERSON, JR. (*Jour. Amer. Chem. Soc., 61 (1939), No. 9, pp. 2534–2537, fig. 1*).—A successful synthesis was accomplished for the triene noted. The conjugated system possessed by this triene is identical with that present in all antirachitic vitamins, and represents the least stable portion of the vitamin molecule. The molecular extinction coefficient of this triene is nearly identical with that reported for the antirachitic vitamins.

**Synthetic and natural antihemorrhagic compounds,** H. J. ALMQUIST and A. A. KLOSE. (Univ. Calif.). (*Jour. Amer. Chem. Soc., 61 (1939), No. 9, pp. 2557, 2558*).—In continuance of the work noted previously (E. S. R., 83, p. 14), assay results are presented on the antihemorrhagic activity of a number of naphthoquinones and related compounds. 2–Methyl–3(?)–phytyl–1,4–naphthoquinone prepared by condensation of 2–methyl–1,4–naphthoquinone with phytol, and purified by repeated molecular distillation, gave analytical results in good agreement with values calculated for the formula $C_{31}H_{46}O_2$. The various properties noted for the compound were similar to those noted for vitamin K from alfalfa. When administered orally to vitamin K-deficient chicks 3 weeks old, at a level of 0.2 mg. per chick, the synthetic compound restored blood-clotting power to normal within a few hours. The product, when exposed to an argon light, showed the white fluorescence observed as characteristic of solutions of the vitamin, the purified pigment derived from the vitamin by alkaline hydrolysis, the low temperature distillate from the molecular still (contains no vitamin K), and pure phytol. The 2–methyl–1,4–naphthoquinone did not show this fluorescence.

**The constitution and synthesis of vitamin $K_1$,** S. B. BINKLEY, L. C. CHENEY, W. F. HOLCOMB, R. W. MCKEE, S. A. THAYER, D. W. MACCORQUODALE, and E. A. DOISY (*Jour. Amer. Chem. Soc., 61 (1939), No. 9, pp. 2558, 2559*).—This communication presents further evidence bearing on the nature of the semicarbazone and the quinone acid noted in the previous communication (E. S. R., 83, p. 15). The nature of the semicarbazone was established by mixed melting point determination with an authentic specimen, and the quinone acid, prepared in sufficient quantity for more satisfactory study, was identified as 2-methyl-1,4-naphthoquinone-3-acetic acid. Further confirmatory experiments here reported are considered to demonstrate conclusively that the structure of vitamin $K_1$ is correctly represented by the formula 2-methyl-3-phytyl-1,4-naphthoquinone. This structural formula was confirmed by synthesis; the hydroquinone of the vitamin was formed (using the method of Claisen) by reaction of phytyl bromide with a benzene suspension of the monosodium salt of 2-methyl-1,4-naphthohydroquinone. After oxidation by the air to the quinone, the product was purified and then subjected to reductive acetylation. The diacetate formed in this manner and crystallized from methyl alcohol gave analytical values for carbon and hydrogen corresponding to those calculated for the formula $C_{35}H_{52}O_4$; the mixed melting point with an authentic specimen of diacetate from the natural vitamin showed no depression.

**Synthetic approach to vitamin $K_1$,** L. F. FIESER, W. P. CAMPBELL, E. M. FRY, and M. D. GATES, JR. (*Jour. Amer. Chem. Soc., 61 (1939), No. 9, p. 2559*).—In seeking a method for the introduction of the phytyl group into the 3-position of 2-alkyl-1,4-naphthoquinones, it was found that, with anhydrous oxalic acid in dioxane solution, methylnaphthohydroquinone could be condensed with simple $\beta$-unsaturated alcohols and dienes to give considerable amounts of the uncyclized substituted hydroquinones. Several examples of such condensation are cited, including one in which phytol entered into condensation giving viscous oils of the composition of the substituted hydroquinone or of tocopherol. One such preparation upon purification appeared to be the tocopherol. Synthesis by the addition of a Grignard reagent to 2-alkyl-1,4-naphthoquinone oxide did not appear promising.

**Synthesis of 2-methyl-3-phytyl-1,4-naphthoquinone,** L. F. FIESER (*Jour. Amer. Chem. Soc., 61 (1939), No. 9, pp. 2559–2561, fig. 1*).—In applying the method noted above, it was found possible to produce a considerable amount of the substituted hydroquinone by using a large excess of methylnaphthohydroquinone to accelerate the bimolecular condensation reaction and by operating at a temperature of 75° [C.] where cyclization is slow. Such a preparation, separated from the unchanged hydroquinone and oxidized in dry ether with silver oxide, gave 2-methyl-3-phytyl-1,4-naphthoquinone as a pure yellow, rather mobile oil, which, upon analysis, gave carbon and hydrogen values in good agreement with those calculated for $C_{31}H_{46}O_2$. Trichloroacetic acid was also found to be satisfactory in place of oxalic acid.

The preparation gave the Dam-Karrer test with alcoholic alkali, and an absorption spectrum closely resembling that reported for vitamin $K_1$ by Dam et al. (E. S. R., 82, p. 441), the positions of the maxima corresponding closely with the values given by Dam et al. and by Doisy et al. (E. S. R., 83, p. 13). The substance subjected to bio-assay (by W. L. Sampson) was found to have marked antihemorrhagic activity, $2\gamma$–$4\gamma$ of the quinone being equivalent to approximately 75 mg. of alfalfa. Reductive acetylation gave the quinone diacetate, which upon recrystallization from methanol melted at 57°–59°. The corresponding diacetyl derivative of the natural vitamin $K_1$ was found by Doisy et al. to melt at 59°. A number of reasons are advanced for considering that the phytyl group is probably linked to the terminal carbon atom.

**Identity of synthetic 2-methyl-3-phytyl-1,4-naphthoquinone and vitamin $K_1$**, L. F. FIESER (*Jour. Amer. Chem. Soc., 61 (1939), No. 9, p. 2561*).—The synthetic product, prepared as noted in the above abstract, was compared with the natural vitamin (supplied by B. Riegel) prepared as a highly purified 3–5 percent alfalfa concentrate by the method of Riegel et al. (E. S. R., 83, p. 445). An alcoholic solution of this concentrate was shaken with aqueous hydrosulfite, and the vitamin hydroquinone was taken up in petroleum ether from which it was extracted with Claisen's alkali containing hydrosulfite, and recovered from the resulting yellow liquor by dilution with water and extraction with ether. Upon digestion with ether and centrifugation, a white solid was obtained which, upon oxidation, yielded 60 mg. of $K_1$ as a yellow oil. This product and the synthetic product were alike in the matter of elementary composition, both gave the characteristic Dam-Karrer color test, their absorption spectra agreed closely, they showed similar antihemorrhagic activity when subjected to bio-assay, and they gave, upon reductive acetylation, diacetates which were apparently identical as judged by determination of the mixed melting point. This latter point was confirmed by Doisy who also found that the synthetic diacetate did not depress the melting point of a purified sample of his diacetate from natural vitamin $K_1$.

Ten mg. of the synthetic vitamin given by mouth with 3 gm. of ox bile to a patient with a complete malignant biliary obstruction markedly reduced the clotting time, and given intravenously successfully carried the patient through operation without abnormal bleeding.

In contrast with the synthetic compound of the methyl series, the ethyl compound did not separate from the petroleum ether, and upon bio-assay was found inactive in a fairly high dosage. It is concluded that vitamin $K_1$ is 2-methyl-3-phytyl-1,4-naphthoquinone.

**Changes of nitrogen content brought about by denaturation of proteins**, B. M. HENDRIX and J. DENNIS (*Jour. Biol. Chem., 126 (1938), No. 1, pp. 315–322, figs. 5*).—In a further study of protein denaturation (E. S. R., 73, p. 5) it has been shown that denaturation of crystalline egg albumen by alkali, acid, or shaking results in a decrease in its percentage nitrogen. Edestan contains less nitrogen per mole than does edestin. The nitrogen removed from the protein during denaturation is insufficient to account for the observed effects. It is suggested that these effects are explainable by a hydrolysis with direct addition of water to the protein molecule.

**The decomposition of cystine in aqueous solution**, J. I. ROUTH (*Jour. Biol. Chem., 126 (1938), No. 1, pp. 147–154*).—Cystine was decomposed by boiling with distilled water. From 96.3 to 100.6 percent of the original sulfur could be accounted for in the various fractions. Not all of the sulfur present at the end of the experimental period could be accounted for as cystine, cysteine, hydrogen sulfide, and elementary sulfur. The formation of acid decomposition products was suggested by the progressive decrease in the pH of the solutions as the time of heating was increased. The fact that the total nitrogen content of the cystine solution remained unaltered indicated that no ammonia was liberated from the reaction mixture and presumably no deamination had occurred.

**The fat acids in the lecithin and glyceride fractions of egg yolk**, R. W. RIEMENSCHNEIDER, N. R. ELLIS, and H. W. TITUS. (U. S. D. A.). (*Jour. Biol. Chem., 126 (1938), No. 1, pp. 255–263*).—Lecithin and glyceride fractions of high purity were prepared from egg yolk, in quantities sufficient to permit a study of the fat acid composition. Palmitic and stearic acids were the only saturated acids identified. Some evidence of small amounts of a lower saturated acid was found in the glyceride fraction. Oleic, linoleic, and clupanodonic acids were found in lecithins and glycerides, and 9,10-hexadecenoic acid was isolated from the glycerides.

**Quantitative studies of carnosine and anserine in mammalian muscle.—I, A method for the determination of carnosine and anserine; II, The distribution of carnosine and anserine in various muscles of different species,** J. A. ZAPP, JR., and D. W. WILSON (*Jour. Biol. Chem., 126 (1938), No. 1, pp. 9–18, 19–27*).—In the first paper a method is proposed in which carnosine is determined by a diazo method after mercury precipitation, and anserine is calculated from the increase in α-amino nitrogen after hydrolysis.

In the second paper quantitative studies of the distribution of carnosine and anserine in various muscles are reported. It is noted that in animals from which carnosine and anserine, or both, have been isolated the amounts found by isolation are roughly proportional to the amounts found by quantitative determination.

**Some characteristics of the androgenic fractions from bull urine,** L. W. BUTZ and S. R. HALL. (U. S. D. A.). (*Jour. Biol. Chem., 126 (1938), No. 1, pp. 265–271*).—The androgens excreted in the urine by the bull were found to be α,β-unsaturated ketones or substances with very similar properties. Their instability toward alkali "emphasizes again the inadvisability of employing alkaline hydrolysis during the isolation of natural androgens."

**A device to prevent bumping and promote boiling,** S. PALKIN and T. C. CHADWICK. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed., 11 (1939), No. 9, pp. 509, 510, figs. 2*).—A test tube of suitable size is modified for this purpose by drawing in the convex end to form a slightly reentrant surface, onto the center of which is sealed a small knob of glass to serve as the point of attachment for the winding of glass thread. The glass-thread winding is run up the outside surface of the tube above the level of the liquid in the distilling flask, and the tube is provided with an internal electric heating coil of asbestos-covered resistance wire immersed in oil. Alternatively, the tube and glass-thread winding may be heated by passing steam into the tube, if the boiling point of the liquid to be distilled is not above about 90° C. The boiling promoter may be inserted into the distilling flask through a stopper or expanded at a suitable point, such that the end will just clear the bottom of the flask, and fitted into the ground joint neck.

**Electric melting point microapparatus,** R. E. DUNBAR. (N. Dak. Agr. Col.). (*Indus. and Engin. Chem., Analyt. Ed., 11 (1939), No. 9, pp. 516, 517, figs. 3*).—A device which may be used with a hand lens or on the stage of a microscope is described, and its construction is shown in a partially dimensioned drawing. A circular block of aluminum, ⅞ in. thick and 2½ in. in diameter, is provided with a central depression fitted to hold two microscope cover glasses under a heavier and slightly larger circular cover glass concentric with a small central vertical opening drilled through the block for transmitted light from below. The thermometer is inserted horizontally so that its bulb lies close under the cover glasses and a little to one side of the center. The heating element is let into a groove cut around the cylindrical block near its base. The rate of heating is controlled by a rheostat. The projecting part of the thermometer is protected by a metal tube screwed into the block, which is mounted on a transit base provided with a 10-w. bulb under the illuminating opening.

**Vial holder,** J. A. QUENSE and W. M. DEHN (*Indus. and Engin. Chem., Analyt. Ed., 11 (1939), No. 9, p. 483, fig. 1*).—The device described, made from 13-gage spring brass or from 16-gage coppered steel wire, has jaws of the test-tube holder type, but the handle part of the holder is replaced by a ring of the same wire from 3 to 4 in. or more in diameter under the jaws and concentric with the vial or test tube held in them. The device supports small vials or test

tubes above the surface of a hot plate (the use illustrated) or projecting downward through the ring and into a steam bath. The value of this holder for preventing vials or tubes from upsetting during the process of filtering into them is also pointed out.

**Paints and plasters for rammed earth walls, R. L. Patty** (*South Dakota Sta. Bul. 336 (1940), pp. 39, figs. 22*).—Cement stuccoes satisfactory for ordinary stucco work were found satisfactory for application to rammed earth walls. The wall should season for several months, however, before stucco is applied, and for walls more than 8 ft. in height bonding wire or mesh should be used, as on frame walls. Two inexpensive plasters which proved quite satisfactory on rammed earth walls were dagga-cement plaster and dagga plaster with an admixture of asphalt emulsion.

Paints on exterior rammed earth walls were generally disappointing. Only a comparatively small number of paint panels proved satisfactory. Good quality lead-oil paints have shown satisfactory results on high-quality walls only, for exterior work. Paints should be tried only after careful study of the paint-panel results and with a thorough knowledge of the soil used in the construction of the wall. Linseed oil and glue sizing proved equally satisfactory for priming coats for lead-oil paints, and possibly fish oil may be equally good. Priming coats that penetrate the wall were found definitely unsatisfactory. No transparent paint has been found satisfactory as yet. Linseed oil did little damage to the wall surface, but showed low durability. Other transparent paints, except some extremely temporary ones, damaged the wall deeply. Most good quality paints were quite successful on interior walls. Cold-water paints, except whitewash, were satisfactory. Common wall plaster was quite successful on interior walls, and nailing the scratch coat to the wall was satisfactory on all panels tried.

It is further noted that "the most valuable and most practical admixture yet tried for rammed earth walls is ordinary sand. It may or may not contain a reasonable amount of coarse aggregate. Some coarse aggregate in the admixture will neither be an advantage nor disadvantage to the weathering quality of the wall nor to the success of the covering. A well-graduated sand and aggregate will increase the strength of the wall, slightly, over an admixture of sand containing uniform-sized particles."

## AGRICULTURAL METEOROLOGY

**[Meteorological work by the Florida Station]** (*Florida Sta. Rpt. 1939, pp. 135–138, 149–151, 173, 174, 175, 181, fig. 1*).—This work included horticultural protection services by the station in cooperation with the U. S. Weather Bureau (forecast and frost warning service, accuracy of forecasts, shippers' bulletin, and research work on critical temperatures, temperature inversion, cost of grove heating, supplemental frost protection, forecasting research, and temperature survey), by E. S. Ellison; meteorological records by the Everglades Substation, with tables and curves, relative to temperatures, rainfall and evaporation, drought effects on soils and crops, and wind velocity and barometric pressure; notes on rainfall, and tables showing precipitation and monthly mean temperature at the North Florida Substation; and drought conditions at the Subtropical Substation.

**[Weather data at the Georgia Coastal Plain Station]** (*Georgia Coastal Plain Sta. Bul. 30 (1939), pp. 14, 15*).—Tabulated data are presented on rainfall in inches by months and years, 1923-38; dates on which the first and last killing frosts occurred and the number of growing days at Tifton, 1923-38; and the temperature by months, 1938.

**Monthly Weather Review [March–April 1940]** (*U. S. Mo. Weather Rev., 68 (1940), Nos. 3, pp. 63–94, pls. 14, figs. 12; 4, pp. 95–124, pls. 15, figs. 4*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and other information, these numbers contain articles on page 591 and the following contributions:

*No. 3.*—On the Distortion of Stream Fields by Small Heat Sources, by J. J. George (pp. 63–66); and Floods in the Sacramento Valley, February 27–March 6, 1940, by E. H. Fletcher (pp. 71–74).

*No. 4.*—An Instrument for the Spectroscopic Determination of Precipitable Atmospheric Water Vapor, and Its Calibration, by I. F. Hand (pp. 95–98).

**Climatological data for the United States by sections, [January–December 1939]** (*U. S. Dept. Agr., Weather Bur. Climat. Data, 26 (1939), Nos. 1–12, [about 200 pp., 2 pls., 8 figs. each]*).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

**Precipitation and evaporation in New Mexico, E. L. Hardy, J. C. Overpeck, and C. P. Wilson.** (Coop. U. S. D. A.). (*New Mexico Sta. Bul. 269 (1939), pp. 68, figs. 41*).—While much the larger part of New Mexico is either arid or semiarid, somewhat below the summits of the highest mountains the average annual precipitation is probably 30 in. or more. It is usually higher on the east and south sides of mountains than at similar elevations on the west and north sides. The average annual precipitation for the State as a whole is 14.43 in. In the dry-farming regions, about three-fourths of the annual precipitation usually occurs during the growing season and a large percentage as brisk showers. Despite the aridity of the climate, however, torrential rains occasionally occur. Snowfall in the mountains, especially in northern New Mexico, furnishes a large percentage of the water used for irrigation. This water carries a comparatively small amount of sediment. Except in mountainous regions, little snow falls in the southern part. Hail occurs in all sections, but the area covered by destructive hailstorms is generally very limited. Of the stations for which records are available throughout the entire year, the highest evaporation, 130.670 in., is at Florida in Luna County, and the lowest, 51.443 in., is at Farmington, in San Juan County. Included are tabulations of normal precipitation by months for all U. S. Weather Bureau stations at which at the close of 1938 such records had been kept for at least 9 yr., average annual and seasonal precipitations and total precipitation for each county, and evaporation data for various sections of the State. An appendix presents detailed precipitation data for State College, N. Mex.

**Hydrologic studies: Compilation of rainfall and run-off from the watersheds of the Missouri Valley Loess Region Conservation Experiment Station, Clarinda, Iowa, 1934–38, L. H. Schoenleber** (*U. S. Dept. Agr., Soil Conserv. Serv., 1940, SCS-TP-31, pp. [99], pls. 6, figs. 48*).—Preceding the presentation of the data (tables and curves) compiled from hydrologic investigations on small watersheds of this region, making up the main body of the report, the author gives the history of the station, histories and descriptions of the watersheds, and discussion of the methods and instruments used.

**Interception of rainfall by prairie grasses, weeds, and certain crop plants, O. R. Clark.** (Univ. Nebr.). (*Ecol. Monog., 10 (1940), No. 2, pp. 243–277, figs. 8*).—In these studies at Lincoln, Nebr., pans were placed beneath the plants with minimum disturbance of the foliage, and water applied at predetermined rates to simulate rainfall or natural rain which penetrated the plant cover was measured. The percentage of interception was found to vary with intensity of rainfall, density of foliage, and environal conditions. Wind

movement and condition of sky proved especially important because of their effects on evaporation. Detailed data are presented for individual plant species under varying intensities and amounts of rainfall. Lowland forbs withheld from the soil nearly half of the water during heavier showers and about two-thirds during the lighter ones. Upland forbs intercepted 20–50 percent or more of the water falling on them, depending on the intensity. Interception by common weeds varied from 34 percent with half-inch rains to nearly 70 percent with eighth-inch showers. Mat-forming weeds held on their leaves and stems 9–50 percent of the water falling during applications of different intensities. The maximum capacity of interception ranged from 47 to 261 gm. of water per square-foot area of living plant materials, while dead plants held 156–446 gm. on similar areas.

Water is held on plants as thin films or as drops forming on the surface, at the tips, or along the margins of leaves. It also adheres to the stems. Extent of leaf surface and number of levels at which water may be held are important in determining interception. Prairie vegetation has a foliage area 3–20 times as great as the soil surface, and leaves are displayed at many levels. In these studies the amount of water reaching the soil by running down the stems was found to be small. Interception by prairie grasses, weeds, and crop plants results in an important loss of water to the soil, and light showers are ineffective in replenishing the soil water. Annual losses of water due to interception, transpiration, and evaporation are as high in certain grasslands as in adjacent forested areas. However, interception by herbaceous plants has an important retarding effect on run-off and indirectly on soil erosion, and grassland is important for the conservation of water through its effect on run-off and percolation as well as in checking evaporation by shading the soil.

**Advantages in the nonuniform hour of observation in the interpretation of published precipitation data,** J. R. Miles (*U. S. Mo. Weather Rev., 68 (1940), No. 4, pp. 99, 100, figs. 2*).—"By a juxtaposition of the 24-hr. precipitation records of nearby stations of varying times of observation, the maximum probable period of precipitation for a given storm will, in many cases, be considerably shorter than that possible to be determined if all stations took observations at a uniform hour."

**The relation of weather factors to wheat yields on Levan Ridge, Utah,** N. E. Zink (*U. S. Mo. Weather Rev., 68 (1940), No. 3, pp. 66–71, figs. 8*).—For the 25 yr. for which data were available, 120 different combinations of weather factors, and yields and dates for planting, emergence, heading, and ripening of wheat were studied for the Levan Ridge, a 24-square-mile area near the center of Utah. Results were especially disappointing for the planting period, commonly considered one of the critical periods. However, the relation of planting period to climatic factors in the fall appears to be obscured by 2 facts, viz, that it is actually soil moisture which is most important, and that the data concerning the period after planting should be treated in 2 groups—one when the wheat emerges in the fall and the other when it fails to emerge before snowfall. In half the years under study it emerged in the fall, and in all but one of these years yields were above average. It was further evident that a large amount of rain did not increase the yields proportionately.

The study emphasized the high importance of spring conditions and especially in the period 2–3 weeks before heading, the date of which varied from June 4 to 30. Correlations between yields and factors of several other periods were also significant. These periods were (1) April 1 to heading, (2) 5–25 days preceding heading, (3) a 5-day period just preceding the last-named

period, and (4) a group of general factors including rainfall from planting to heading, 40 percent of the fallow rain plus the rainfall from planting to ripening, lowest temperatures of April, and average temperature for April, May, and June. The highest correlations were with evaporation, length of drought period, and rainfall. It is because evaporation represents the integration of several other factors, such as temperature, humidity, and wind velocity, that its coefficient of correlation is consistently so high. It was evident that one weather factor is highly correlated with others, that relations between weather factors and yields are not necessarily linear, and that there can be strict proportionality over only a very narrow range of variation. Yields above or near the average seemed to show this proportionality, while very low yields were frequently due to unmeasurable causes, or to a combination of causes. Correlations for plant-growth stages gave somewhat higher coefficients than those obtained by use of seasonal or monthly data.

When the date of planting varies 1½ mo. and the heading date 1 mo., and when the critical stage of plant growth covers a very short period, the importance of using plant-growth periods rather than calendar months is seen. The graphs presented "show the advantages of using plant growth stages, the lack of relation between rainfall of the harvest year and yield, the closer relationship between extreme temperatures and yield than average temperatures and yield, that early June rain is important, that too heavy rainfall at planting time is not desirable, and that late planting usually lowers yields."

## SOILS—FERTILIZERS

**[Soil investigations at the Florida Station]** (*Florida Sta. Rpt. 1939, pp. 81–83, 86–91, 142, 143, 155, 156, 169, fig. 1*).—The report contains notes on soil and water conservation; determination of the effect of green manures on the composition of the soil, by F. B. Smith; the occurrence and behavior of less abundant elements in soils, by R. M. Barnette; a study of the so-called quick methods for determining soil fertility, by R. V. Allison and C. E. Bell; soil and vegetation surveys in relation to pasture development in Florida, by J. R. Henderson; types and distribution of micro-organisms in Florida soils, the metabolism and functional relationships of soil micro-organisms, and interrelationships of microbiological action in soils and cropping systems in Florida, all by Smith; methods of inoculating legumes in Florida soils, by Smith and R. E. Blaser; the effect of type and treatment of Florida soils on the yield and composition of farm crops, by Allison and Bell; effect of type and treatment of Florida soils on the yield and composition of truck, bush, and tree crops (other than citrus), by Allison and H. W. Winsor; effect of type and treatment of Florida soils on yield and composition of citrus fruits, by Allison; classification and mapping of Florida soils according to modern survey methods, by Allison and Henderson (coop. U. S. D. A.); citrus soils investigations, by M. Peech; soil investigations, by J. R. Neller and W. T. Forsee, Jr.; and relation of organic composition of crops to growth and maturity, by Forsee, Jr.

**[Soil investigations at the New Jersey Stations]** (*New Jersey Stas. Rpt. 1939, pp. 118–125*).—These have included soil testing, elimination of arsenical residues from the soil, influence of minor elements on plant growth, nitrogen availability studies, a comparison of magnesian and nonmagnesian forms of lime, the influence of organic matter on crop yields and on the composition of the soil, influence of potash on the weight of grains and forage crops, the movement of water and soil constituents in the soil profile, base exchange in soils, survey of soil ingredients in the soil profile, humus and soil conserva-

tion, production of organic acids by fungi, a study of the *Actinomyces* population of the soil, and the interrelations between soil micro-organisms and higher plants.

**[Soil investigations at the Puerto Rico College Station]** (*Puerto Rico Col. Sta. Rpt. 1939, pp. 75–78*).—Subjects reported upon briefly are as follows: Chemical comparison between soils of humid and arid areas, and the nature of laterization as revealed by chemical, physical, and mineralogical studies of a lateritic soil profile from Puerto Rico, both by J. A. Bonnet; and fertilizer and soils studied with Mitscherlich's pot tests, by B. G. Capó.

**[Soil Survey Reports, 1933 and 1934 Series]** (*U. S. Dept. Agr., Bur. Plant Indus. [Soil Survey Rpts.], Ser. 1933, No. 32, pp. 40, figs. 2, map 1; 1934, No. 19, pp. 45, figs. 3, map 1*).—These surveys were made in cooperation with the Iowa Experiment Station: 1933, No. 32, Davis County, Iowa, C. L. Orrben and G. A. Swenson; and 1934, No. 19, Osceola County, Iowa, C. L. Orrben et al.

**The relations of soils and surface in the South Carolina Piedmont,** D. H. EARGLE. (U. S. D. A.). (*Science, 91 (1940), No. 2362, pp. 337, 338*).—Examinations of recently exposed gullies largely in Spartanburg County, S. C., revealed deposits of organic matter as much as 12 ft. thick and buried under 20 ft. or more of soil. Most of these deposits were rich in pollen and contained quantities of stem fragments, trunks, stumps, and roots of trees as well as sedges and other herbaceous plants, usually well preserved. Pollen analyses showed an abundance of fir and spruce, indicating a considerably colder climate at the time the deposits were formed. The author states "that the material which overlies the organic deposits has migrated down slope en masse as soil creep, earth flow, and slumping, and perhaps to some extent as sheet wash, cannot be questioned." Previously, most Piedmont soils were thought to have developed from material of residual origin, but the discovery of organic matter underlying many of them and the existence within the soils themselves of the evidence of migration show that they are not everywhere residual. It is pointed out that physiography and land forms should be emphasized in the mapping and interpretation of soil types, and conversely the influence of soil considered in the development of surface configuration.

***The identification of minerals in soil colloids,*** G. NAGELSCHMIDT (*Jour. Agr. Sci. [England], 29 (1939), No. 4, pp. 477–501, figs. 5*).—The X-ray, optical, dehydration, and chemical methods used in the identification of minerals in soil colloids have been studied and their limitations noted, particularly the uncertainty with regard to the variation of physical properties of standard minerals with decreasing grain size and the possible existence and importance of amorphous material. The author points out the advantages of combining various chemical methods with X-ray analysis, gives standard data for several minerals, and reviews the evidence for their occurrence in soil colloids.

**Effect of lime on the nitrogen content of cow manure,** A. R. MIDGLEY and W. O. MUELLER (*Vermont Sta. Bul. 456 (1940), pp. 20, figs. 6*).—Caustic forms of lime, if mixed with fresh manure, may actually help save nitrogen. The high basicity temporarily retards ammonia production so that less nitrogen is subject to loss by field drying. However, the caustic lime must be added to the cleaned gutter where it comes in direct contact with fresh unammonified manure. As soon as the lime becomes carbonated it loses its excess basicity and is of little or no use. A substantial saving of nitrogen may be effected if the manure is incorporated into the soil before carbonation of the lime is complete. Caustic forms of lime should not be mixed with fermented manure as they readily drive off the ammonia already present. Ground limestone is quite indifferent when applied to fresh manure, and but slightly detrimental when applied to

fermented manure. Ground limestone may be spread with either fresh or fermented manure on the loaded spreader with little loss of nitrogen, since it comes in direct contact with only a small portion of the manure. Plant-growth studies in greenhouse and field plats substantiated these findings.

**Inspection of fertilizers,** W. L. ADAMS, T. WEIGHT, JR., and R. L. SWALLOW (*Rhode Island Sta. Ann. Fert. Cir., 1940, pp. 19*).—This report on analyses of commercial fertilizers sampled in 1939 notes the acid-forming or non-acid-forming character of each commercial mixture listed and contains a separate tabulation of the magnesium content as the oxide in the 15 fertilizers offering a guaranteed content of this element.

**Decomposition of dolomitic limestone in fertilizers,** E. R. COLLINS and F. R. SPEER. (N. C. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem., 23 (1940), No. 2, pp. 373–388, figs. 7*).—Buffer capacity and pH are the major soil factors involved in the decomposition of dolomitic limestone. The most satisfactory index of carbonate decomposition is the determination of the residual carbonates. According to the authors, "calcined, 80-mesh and finer, and composite dolomitic limestones of the quality used in these experiments should supply at least a large part of the magnesium needs of plants."

**Absence of reversion in ammoniated and limed superphosphates of low fluorine content,** W. H. MACINTIRE and L. J. HARDIN. (Tenn. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem., 23 (1940), No. 2, pp. 388–398*).—"This paper deals with the effect of ammoniation and of four liming materials upon $P_2O_5$ availability in standard and triple superphosphates made from starting phosphates of variant fluoride content." In superphosphates derived from starting materials of normal fluoride content processed and aged 1 mo. at 45° C., marked reversion occurred, while none developed in superphosphates processed from phosphates low in fluoride. Those superphosphates having a meager fluoride content can be ammoniated or mixed with ordinary high calcic liming materials without loss of $P_2O_5$ availability.

**Peat and swamp muck for soil improvement in Connecticut,** M. F. MORGAN (*Connecticut [New Haven] Sta. Cir. 142 (1940), pp. 85–96*).—Estimating on the conservative basis of an average depth of 6 ft., the author finds the muck and peat deposits of Connecticut available for soil improvement use to amount to about 500 million cubic yards. On the basis of prices paid for imported baled peat moss, the value of the State peat deposits would be from $4 to $5 per cubic yard, giving swamplands otherwise of very low value a potential production of from 2 to 2.5 billion dollars.

The various types of peat are briefly discussed, and it is noted that the greater part of the Connecticut peats is of the woody type. The value of peat and muck as soil improvement material lies in the ability of such organic matter to increase available water-holding capacity, to improve the tilth of soils either stiff and sticky when wet or hard when dry, or both, and to provide organic matter more stable than that furnished by organic fertilizers or manures. The acidity of most peats is pointed out, and the need for liming soils treated with peats, except for growing of acidophilous plants, is emphasized. The stimulating effect on growth of cuttings observed when peat is added to sand is also noted.

## AGRICULTURAL BOTANY

**Plant material introduced by the Division of Plant Exploration and Introduction, Bureau of Plant Industry, January 1 to March 31, 1936** (*U. S. Dept. Agr., Inventory 126 (1940), pp. 32*).—This number lists 801 lots of plant material, with descriptive notes in many cases.

**Advances in botany**, F. E. DENNY (*News Ed.* (*Amer. Chem. Soc.*), *18* (*1940*), *No. 2, pp. 59–63, figs. 5*).—This is a critical review (46 references) of recent contributions on growth and differentiation; mineral nutrition; grass, milkweed, and fungus studies; and diurnal cycles, synergesis and symbiosis, chimeras, plant disease viruses, plastids, and nitrogen fixation.

**Recent investigations on economic plants**, A. F. HILL (*Chron. Bot.*, *5* (*1939*), *No. 4–6, pp. 372–375*).—A brief review.

***The cultivation of plant species from seed to flower and seed in different agar solutions***, G. GENTCHEFF and A. GUSTAFSSON (*Hereditas, 26* (*1940*), *No. 1–2, pp. 250–256, pl. 1, figs. 4*).—The authors describe a method by means of which it is said that plants may be grown in hormonal media during the whole life cycle. It is believed that this type of artificial cultivation will give a normal response of the plant under certain controlled environal conditions, even if the hormone or salt concentrations are sometimes detrimental to the organism.

**A sterile transfer chamber**, A. F. ROB (*Jour. Bact.*, *39* (*1940*), *No. 5, pp. 589–592, fig. 1*).—The chamber described and illustrated is said to permit pouring of plates, inoculating them, examining and picking colonies, and other phases of open technic in a sterile atmosphere. The confined air is sterilized by contact with the free flame of the burner and by a continuous condensation of water-vapor particles against the cooler side walls of the chamber.

**The distribution of self-sterility in the flowering plants**, E. M. EAST (*Amer. Phil. Soc. Proc.*, *82* (*1940*), *No. 4, pp. 449–518*).—This question was investigated in over 800 species of flowering plants. Report of its occurrence in the various orders is based on the author's studies and such information as was available in the scattered literature (nearly 4 pages of references). Self-sterility proved to be widespread among the orders, but more so in the more specialized groups and especially in the orders including only or primarily herbaceous plants. A greater incidence among herbaceous forms was to be expected, since these types are derived from the more primitive woody species and self-sterility must be a relatively recent innovation in sexual reproduction. Self-sterility in promoting variation and in perpetuating heterozygosity has apparently played an important role in the evolutionary development of flowering plants.

**The nomenclature of cultivated plants**, A. B. STOUT (*Amer. Jour. Bot.*, *27* (*1940*), *No. 5, pp. 339–347*).—Noting that the application and significance of the botanical names of species and varieties should be kept clearly in mind, the author presents the concepts of the species, and of variation and the variety. With reference to cultivated plants, he discusses the production of cultivated varieties or "cultivars" by artificial selection, the utilization of natural processes in artificial selection, and individual and clonal propagation. The rules for nomenclature of cultivated plants are next reviewed, and evaluated, certain defects are pointed out as pertaining to cultivated plants, the whole problem is summarized, and certain recommendations are made.

***Stability in nomenclature***, A. C. SMITH (*Science, 91* (*1940*), *No. 2372, pp. 572, 573*).—A discussion of various proposals for a new series of beginning dates for botanical nomenclature. It is believed that the confusion will be decreased without legislation and indeed is becoming clarified with every careful monograph.

**The new systematics**, edited by J. HUXLEY (*Oxford: Clarendon Press, 1940, pp. VIII+583, figs. [55]*).—The following chapters are of special interest to botany: Experimental and Synthetic Plant Taxonomy, by W. B. Turrill (pp. 47–71); Ecological Aspects of Plant Taxonomy, by E. J. Salisbury (pp. 329–340); Taxonomic Problems in Fungi, by J. Ramsbottom (pp. 411–434); Taxonomic

Botany, With Special Reference to the Angiosperms, by T. A. Sprague (pp. 435–454); The Origin and Behaviour of Cultivated Plants, by M. B. Crane (pp. 529–547); and The New Systematics of Cultivated Plants, by N. I. Vavilov (pp. 549–566).

**The concept of the genus, I–V,** (*Bul. Torrey Bot. Club, 67 (1940), No. 5 pp. 349–389*).—This symposium consisted of the following papers: I, History of the Generic Concept in Botany, by H. H. Bartlett (pp. 349–362); II, A Survey of Modern Opinion, by E. Anderson (pp. 363–369); III, Genera From the Standpoint of Morphology, by J. M. Greenman (pp. 371–374); IV, The Delimitations of Genera From the Conservative Point of View, by E. E. Sherff (pp. 375–380); and V, Our Changing Generic Concepts, by W. H. Camp (pp. 381–389).

**Taxonomy and floristics of the Americas, H. N. Moldenke** (*Chron. Bot., 5 (1939), No. 4–6, pp. 367–372*).—A brief summary of the work represented in some 450 papers.

**Fungi Imperfecti (Deuteromycetes): A guide to the study of the secondary spore forms of fungi, N. F. Buchwald** (*Fungi Imperfecti (Deuteromycetes): En Vejledning i Studiet af de sekundaere Sporeformer hos Svampene. København (Copenhagen): K. Vet. og Landbohøjsk., 1939, pp. [6]+144, [pl. 1]*).—This is a taxonomic monograph of the group, with copious classified bibliography and author and subject indexes.

**Fungi of the genera Fusarium and Cylindrosporium in Indo-China, F. Bugnicourt** (*Les Fusarium et Cylindrocarpon de l'Indochine. Paris: Paul Lechevalier, 1939, pp. [3]+206, pls. 10, figs. 36*).—A monograph on these genera as they occur in Indo-China including new taxonomy. The preface is by A. Guilliermond.

**Cultural histories of Melanconis and Pseudovalsa, IV, L. E. Wehmeyer** (*Mycologia, 32 (1940), No. 3, pp. 321–330, figs. 22*).—Continuing this series,[1] *M. juglandis caryae* n. var. on *Carya alba* was found to produce hyaline conidia in *Melanconium*-like pustules. *M. corni* n. sp., from *Cornus florida*, produced four-celled hyaline conidia in locules within loosely compacted stroma. *M. nigrospora* and *M. everhartii* failed to produce conidia but developed perithecia freely in culture.

**Ascomycetes from the State of Minas Geraes (Brazil), C. E. Chardon, J. H. Miller, and A. S. Muller** (*Mycologia, 32 (1940), No. 2, pp. 172–204, figs. 37*).—The present paper, based almost exclusively on collections by the junior author aggregating ±1,150 numbers deposited in the herbaria of the Escola Superior de Agricultura at Viçosa and of the department of plant pathology at Cornell University, lists 114 species, 21 of which are described as new, in the genera *Meliola, Dothichloe, Guignardia, Ophiodothella, Hypoxylon, Penzigia, Xylaria, Cutacauma, Phyllachora, Coscinopeltis,* and *Ellisiodothis.*

**Arizona plants: New species, varieties, and combinations, F. J. Hermann, T. H. Kearney, and R. H. Peebles.** (U. S. D. A.). (*Jour. Wash. Acad. Sci., 30 (1940), No. 5, pp. 217–219*).—The genera *Juncus, Astragalus,* and *Echinocereus* are represented.

**A supplement to the catalogue of Iowa plants in the Iowa State College herbarium, A. Hayden,** (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 14 (1940), No. 2, pp. 199–213*).—This supplements the annotated list of R. I. Cratty.[2]

**Annotated list of the plants of Kansas: Ferns and flowering plants, F. C. Gates** (*Kansas Sta., 1940, pp. 266, figs. 82*).—Introductory to the list, the author discusses the history of floristic work in the State, location and area, physiographic regions, drainage, topographic divisions, climate, geology, general

[1] Mich. Acad. Sci., Arts, and Letters, Papers, 23 (1937), pp. 233–242, pls. 3.
[2] Iowa State Col. Jour. Sci., 7 (1933), No. 3, pp. 177–252.

considerations on the flora, ecological classification, native and artificial habitats, growth forms, various lists of plants, and statistics of the Kansas flora. Maps indicate the local distribution of individual species, and an index is provided for the list, which is arranged by taxonomic groupings.

**Flora of the Patuxent Research Refuge, Maryland,** N. HOTCHKISS (*U. S. Dept. Int., Bur. Biol. Survey, Wildlife Leaflet BS-154 (1940), pp. [2]+34. fig. 1*).—In this area, wildlife problems relating to the production of agricultural crops and to forestry are to receive careful study. This check list is the first of a number of reports that will deal with the natural history of this research refuge. It includes a description of the refuge, its location and size, topography and water supply, geology and soils, and a general description of the vegetation.

**Notes on plants of New Mexico, II,** A. L. HERSHEY. (N. Mex. Col. Agr.). (*Leaflets West. Bot., 2 (1940), No. 15, pp. 257, 258*).—Notes on plant collections in the Guadalupe Mountains of southern New Mexico.

**Miscellaneous new American grasses,** J. R. SWALLEN. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 30 (1940), No. 5, pp. 209–217, figs. 4*).—Descriptions are given of 12 new species in the genera *Chusquea, Poa, Stipa, Digitaria, Mesosetum,* and *Panicum,* 4 of them from the United States.

**The botany and history of Zizania aquatica L. ("wild rice"),** C. E. CHAMBLISS. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 30 (1940), No. 5. pp. 185–205, figs. 6*).

**[Plant physiological work by the New Jersey Stations]** (*New Jersey Stas. Rpt. 1939, pp. 100–106*).—Reports of progress are presented relative to preliminary studies on the effect of aeration on plant growth, the relation between the calcium content of plants and the boron concentration of the nutrient substrate, influence of the level of the boron supply on nitrogen and carbohydrate metabolism in young cotton plants, relation of the pH value of the culture solution to the availability of boron for the growth of radish plants, and the availability of potassium in bentonite clay materials for the growth of tomato plants.

**Elements of plant physiology,** P. BOYSEN JENSEN (*Die Elemente der Pflanzenphysiologie. Jena: Gustav Fischer, 1939, pp. XX+458, figs. 162*).—This textbook is a somewhat enlarged translation by F. Mattick of the Danish text published in 1938.

**The transverse reactions of plants: Outlines of a new interpretation of the significance of growth hormones for life-processes in plants,** G. BORGSTRÖM (*Lund: C. W. K. Gleerup, [1939], pp. 230, figs. 58; Ger., Russ. abs., pp. 195–200*).—According to the author, the discussions in this book are based partly on his experiments of the last 2 yr., but largely on a vast amount of work by other scientists (over 26 pages of references). Attention is called to the fundamental significance of transverse distribution of hormones in nature, the relative strength of their polar and lateral passage regulating most processes in plants.

**Investigations of the thermolabile growth-factor-oxidizing substance in Phaseolus seedlings** [trans. title], P. LARSEN (*Planta, Arch. Wiss. Bot., 30 (1940), No. 4, pp. 673–682, figs. 3*).—From this study, the growth-factor-inactivating action of the expressed sap of etiolated *Phaseolus* epicotyls is characterized as follows: It is a thermolabile substance precipitable by alcohol-ether, the inactivation does not take place instantaneously but depends on the duration of the action, and the inactivation of auxin cannot take place without oxygen. It is thus concluded that the auxin-inactivating factor is an oxidation enzyme.

**$B_1$: Its use as a growth regulating substance for green plants,** J. W. SHIVE (*New Jersey Stas. Cir. 399 (1940), pp. 7*).—The author brings together briefly such information as is now available in the scientific literature about

the use of vitamin $B_1$ as a growth stimulant in plant production, and summarizes the authoritative experimental evidence relating to its practical value for general plant culture.

**Ascorbic acid (vitamin C) in fungous extracts,** R. W. Lewis. (Mich. State Col.). (*Mich. Acad. Sci., Arts, and Letters, Papers, 24 (1938), pt. 1, pp. 31–35*).—Using *Cephalothecium roseum, Citromyces (Penicillium) ramosus, Aspergillus* spp., and *Poecilomyces* sp., it was found that they produce relatively large amounts of ascorbic acid when grown on either a synthetic or a nonsynthetic medium. The amounts varied with the kind and age of the fungus colony. Most of the ascorbic acid was intracellular, but there was for each species a relatively constant amount present in the fluid substrate, regardless of age of culture. The intracellular ascorbic acid varied with age of culture, but from species to species was not constant in its variation.

**Colchicine-induced tetraploidy in Lilium,** S. L. Emsweller and P. Brierley. (U. S. D. A.). (*Jour. Hered., 31 (1940), No. 5, pp. 223–230, figs. 5*).—Treated stem apexes of *L. formosanum* produced bulblets, most of which were tetraploids. The tetraploids produced on one plant were all slightly fertile, but only 1 of 9 produced on another was fertile. Tetraploid flowers varied in size but averaged ±25 percent larger than diploid flowers. From selfing the induced tetraploids, 606 seedlings were secured, and 7 of the original 22 tetraploids were increased by scaling.

**Variation of cystoamylase in potato due to different conditions of growing,** A. I. Grechushnikov (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 25 (1939), No. 8, pp. 688–690*).—The amount of cystoamylase (cytoamylase?) in the potato was found to vary with growing conditions, decreasing when the day length is curtailed to 8 hr. and increasing under potassium fertilization. On the other hand, the amount decreased in response to nitrogen and phosphorus, though varietal differences in this respect were noted.

**The role of potassium in plants.—III, Nitrogen and carbohydrate metabolism in potassium-deficient plants supplied with either nitrate or ammonium nitrogen,** M. E. Wall. (N. J. Expt. Stas.). (*Soil Sci., 49 (1940), No. 5, pp. 393–408, pl. 1, fig. 1*).—In further studies (E. S. R., 83, p. 174), young Rutgers tomato seedlings were grown in nutrient solutions containing nitrate and ammonium N, with and without K, and harvested weekly or biweekly for a 2-mo. period. The nitrate plants grew better than the corresponding $NH_4$ plants. The K-deficient plants grown with nitrate gradually developed typical deficiency symptoms, whereas the K-deficient plants with $NH_4$ suddenly exhibited leaf breakdown symptoms totally unlike those in the nitrate plants. From chemical evidence, this rapid break-down was due to the toxic effect of high internal $NH_4$ concentrations. The K-deficient plants of both series accumulated $NH_3$, amide, and amino N, while the protein concentration decreased. Simultaneously the plants showed an initial carbohydrate accumulation which finally decreased, becoming less than in plants supplied with complete K. It seemed that protein synthesis from an elaborated form of N was affected by K deficiency, which would account satisfactorily for the increased $NH_3$, amide, and amino N concentrations, for the decrease in protein, and for the initial accumulation of carbohydrates in K-deficient plants. The analytical data strongly suggested that the N metabolism is affected by K deficiency prior to the carbohydrate metabolism. The final drop in carbohydrate content of K-deficient plants may be due to a direct need for K in $CO_2$ assimilation or to the indirect effects on protoplasm brought about by the interference with the N metabolism in K-deficient plants.

**X-ray diffraction analysis and its application to the study of plant constituents,** W. A. Sisson (*Chron. Bot., 5 (1939), No. 4–6, pp. 344, 345*).—A review and general discussion of the subject.

**The importance of minor elements in vegetable crop production,** R. H. WHITE-STEVENS. (Cornell Univ.). (*Veg. Growers Assoc. Amer. Ann. Rpt., 1939, pp. 146–174, pls. 5*).—This is a general discussion of the subject, with specific reference to deficiencies in Mg, N, P, K, B, Ca, Al, Cu, Fe, Mn, Zn, and their interrelationships. The effects of a deficiency in the first five elements noted above are illustrated in color, and the minor element deficiencies commonly found in vegetable crop production, their symptoms, and general control methods are tabulated.

**Minute amounts of chemical elements in relation to plant growth,** D. R. HOAGLAND. (Univ. Calif.). (*Science, 91 (1940), No. 2372, pp. 557–560*).—An analytical review, with bibliographic footnotes, including reference to the soil and plant interrelations in their bearing on problems of animal nutrition.

**Aluminum in plants** [trans. title], J. BABIČKA (*Chron. Bot., 5 (1939), No. 4–6, pp. 336–338*).—A review.

**Copper as a trace element** [trans. title], B. RADEMACHER (*Chron. Bot., 5 (1939), No. 4–6, pp. 338, 339*).—The author briefly summarizes data on copper as a trace element, in contrast to its stimulative and toxic effects.

**Astragalus artemisiarum Jones as a selenium absorber,** H. W. LAKIN and F. J. HERMANN. (U. S. D. A.). (*Amer. Jour. Bot., 27 (1940), No. 4, pp. 245, 246*).—Collections of this plant at six locations in Nevada yielded 35–970 p. p. m. of Se, although the soils were of relatively low content. The results of these analyses are tabulated and discussed, along with the value of the seleniferous habit in the systematic grouping of plants.

**On the relationship of selenium to sulfur and nitrogen deposition in cereals,** E. P. PAINTER and K. W. FRANKE. (S. Dak. and N. Dak. Expt. Stas. and Univ. Minn.). (*Amer. Jour. Bot., 27 (1940), No. 5, pp. 336–339*).—A number of proteins were isolated from cereal plants and the Se, S, and N contents determined and compared with analyses on the whole cereal. For comparison the results are calculated as molar S : Se and N : Se ratios. Although there was evidence indicating that metabolism of Se by plants is similar to that of S, the metabolism of these elements is not identical because a seleniferous plant with a high sulfate content contained no selenate, and the S : Se ratios of different parts of the same plant were not always constant. Deposition of Se in cereal proteins followed that of S in most cases, but there were a few wide variations in the S : Se ratios. These may have been due to a greater cleavage of S than of Se by the reagent used in separating the proteins. The deposition of Se in cereal proteins apparently follows the deposition of S more closely than that of N.

**Translocation in plants,** A. S. CRAFTS. (Univ. Calif.). (*Chron. Bot., 5 (1939), No. 4–6, pp. 340, 341*).—A review (with references) of recent work bearing on the mechanism of translocation.

**Studies of the transpiration stream in the leaves of Secale cereale and Triticum vulgare** [trans. title], S. STRUGGER (*Ztschr. Bot., 35 (1940), No. 3–4, pp. 97–113, pls. 2*).—The author critically analyzed the method of dye ascent, using a macroscopic optical fluorescence procedure for measuring the rate of the vascular components of the transpiration stream in the veins of thin leaves. Measurements in the wheat leaf indicated that the rate of water movement in the veins depends largely on the stomatal openings. The method described is said to be especially suited to class demonstrations. With berberine sulfate as indicator, the extra-vascular components of the transpiration stream were also followed, it being found that numerous small partial streams are led through the palisade cell walls into the epidermis and up to the transpiring surface of the cereal leaf. These observations further demonstrate the applicability of the Sachs imbibition theory to the parenchyma. In the graminaceous leaf the stomata react particularly well to the berberine test. The presence of especially

large submicroscopic pores was also demonstrated. Since the upper surface of the leaf especially is wettable only with difficulty, it frequently happens that on placing in a sugar-KCNS-gelatin solution only the tips of the surface hairs become immersed in the absorbing solution. Though at the beginning of the sugar-gelatin test the membranes of the leaf hairs have become stained at their bases only through free transpiration, it is observed that later a shifting of the berberine sulfate within the membranes has taken place so that the stain finally reaches the tips of the membrane hairs. This is taken to be further proof of the permeability of the membrane system. The relations of the free transpiration stream have thus been reproduced by a locally acting absorption effect. Other dyes tested produced similar results in microtopographical distribution. The 2-phase Primulin O is also split up in the cereal leaf into its two components. The yellow fluorescent coarse disperse component remains in the conductive elements, whereas the fine disperse blue fluorescing phase spreads into the submicroscopic conductive routes of the parenchyma membranes. There are 16 references.

**Causes of decreased absorption of water by plants in poorly aerated media,** P. J. Kramer (*Amer. Jour. Bot., 27 (1940), No. 4, pp. 216–220, fig. 1*).—Exposing sunflower and tomato roots to high concentrations of $CO_2$ for 1–2 hr. reduced transpiration 34–52 percent, exudation from detopped root systems 63–74 percent, and water movement through root systems attached to a vacuum pump 35–56 percent. Bubbling $O_2$-free nitrogen through the water around the roots reduced transpiration in tomato only ±8 percent, exudation from detopped root systems of sunflower ±9 percent, and water intake through sunflower and tomato root systems attached to a vacuum pump 1–13 percent. Aeration with laboratory air failed to affect exudation the first hour, but materially increased it the second. The small decreases in water intake in the presence of N are believed to result from $O_2$ deficiency. If this is true, it appears that an excess of $CO_2$ reduces absorption much sooner than a deficiency of $O_2$. Active absorption never exceeded 5 percent of the amount lost by transpiration. The effect of high $CO_2$ concentrations in decreasing active absorption is, therefore, much too small to explain the reduced absorption found in intact, transpiring plants. It is believed that the rapid reduction in water intake induced by high concentrations of $CO_2$ results largely from decreased passive absorption caused by physical changes in the protoplasm and protoplasmic membranes. These changes decrease the permeability of the protoplasm and increase the resistance to water movements across the cortex from epidermis to xylem.

**Bibliography on cold resistance in plants** (*Cambridge, Eng.: Imp. Bur. Plant Breeding and Genet., 1939, pp.* [2]+22).—The bibliography covers the general subject as well as specific crop plants, and an author index is provided.

**The mechanism of injury and death by low temperature,** B. J. Luyet and P. M. Gehenio (*Biodynamica, No. 60 (1940), pp. 33–99, figs. 2*).—A review, with over three pages of references.

**A contribution to the question of cold injuries to plants at temperatures above the freezing point** [trans. title], D. Seible (*Beitr. Biol. Pflanz., 26 (1939), No. 3, pp. 289–330, figs. 7*).—Of the plants studied, *Episcia*, *Achimenes*, and *Gloxinia* exhibited after some hours, and at most after a day, the formation of spots traceable to the death of the plasma and infiltration of the intercellular spaces. On the contrary, *Tradescantia*, *Solanum*, and *Coleus*, which are resistant, remained constantly and fully turgid after a day's exposure, but after 5–6 days they suddenly softened and wilted. As a rule the older leaves changed first, the injury advancing toward the growing point. Plants exposed to the cold only at night proved resistant. Rises in osmotic

values were demonstrated by water loss from the leaves, and in *Coleus* the development of osmotically active substances was shown by determining the threshold of plasmolysis. The content of the expressed sap in sugar, organic and inorganic salts, soluble nitrogen, ammonia, and organic acids was investigated before and after cold treatment, and it was concluded that if there is any direct influence of osmotic values, it must lie in the total salts. The proportion of protein N to soluble N was shifted in favor of the latter, and the process was checked in the heat-retaining dark plants. Thus cold injury cannot be ascribed to such change. A change in plasma permeability was proved for *Coleus*. Potassium nitrate penetrated into the cooled plants more rapidly than into the controls. The previously lighted cold-room plants behaved like those held in the dark.

**The oxygen consumption of isolated woody tissues,** R. H. GOODWIN and D. R. GODDARD (*Amer. Jour. Bot., 27 (1940), No. 4, pp. 234–237, figs. 3*).—Thin sections were cut from the trunks of ash and maple trees and their $O_2$ consumption was measured. In those collected before bud break the $O_2$ consumption was most rapid in the cambial region, while values for adjacent secondary phloem and xylem were somewhat lower. In the xylem the $O_2$ consumption became progressively lower in passing toward the center of the tree. In the heartwood there was a very low basal rate of $O_2$ consumption which was not destroyed by boiling. This is believed due to slow oxidation of organic compounds in the dead cells. Phloem and sapwood exhibited similar oxidations of comparable magnitude after boiling. After bud break the $O_2$ consumption of the cambium, phloem, and heartwood of ash was essentially the same as before, but in the newly formed, differentiating xylem it appeared to exceed considerably the cambial rate. The relations described remained essentially the same whether $O_2$ consumption was expressed per gram of wet weight or per milligram of nitrogen.

**Effect of algae in relation to aeration, light, and sources of phosphorus on growth of tobacco in solution cultures,** H. B. ENGLE and J. E. MCMURTREY, JR. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 7, pp. 487–502, figs. 5*).—Connecticut Broadleaf tobacco showed marked growth responses in complete nutrient solutions to the aerating effect of common green algae (principally *Protococcus viridis angulosa* and *Ulothrix parietina*). Using combinations of darkened solutions, those exposed to light, three sources of P, and with roots previously disinfected with $AgNO_3$ (1:1,000) or not disinfected, greatest total growth occurred in darkened solutions aerated with compressed air. The beneficial effect of aeration by algae was most marked in the earlier growth stages, especially without previous disinfection. Average increases in dry weight over unaerated plants in darkened solutions were 82 percent for those aerated by green algae and 92 percent for those by compressed air. Algal growth was not correlated with pH. Ratios of leaf weight to total plant weight were somewhat greater with darkened, artificially aerated solutions than with those aerated by algae. The P from di- and tricalcium phosphate produced growth of tobacco plants in aerated solutions equal to that obtained from monocalcium phosphate, possibly because the roots were more nearly in direct contact with the material. The blue-green alga *Nostoc muscorum*, in a parallel test without added N was unable to fix sufficient atmospheric N significantly to increase the growth of tobacco in the nutrient solutions used.

**Leaf xanthophylls,** H. H. STRAIN (*Chron. Bot., 5 (1939), No. 4–6, pp. 339, 340, pl. 1*).—A brief statement of present knowledge on the chemistry and functions of the leaf xanthophylls.

**The structure of the chloroplast and the location of the chlorophyll,** E. A. Roberts (*Bul. Torrey Bot. Club, 67 (1940), No. 6, pp. 535–541, figs. 11*).—The photomicrographs presented in this preliminary paper show some of the results of a 10-years' series of investigations. The early studies were made on young sporophytes and gametophytes of some 25 species of native ferns. Later, representatives of the Thallophyta, Bryophyta, and Spermatophyta were investigated. The chloroplasts of all the plants studied were found to be made up of units for which the term "plastidules" is proposed. The latter are composed of globular bodies, here called "plastid granules." It is possible to separate the plastidules into their respective plastid granules. The chlorophyll occurs in the colloidal substance of each plastid granule, and the greenness of each chloroplast represents the sum of the color contributed by the chlorophyll of each plastid granule.

**The mechanism of photosynthesis in green plants,** K. Wohl (*New Phytol., 39 (1940), No. 1, pp. 33–64, figs. 4*).—A comprehensive, critical review (93 references) dealing almost entirely with the consideration of assimilation in a steady state and under conditions of $CO_2$ excess.

**Studies on the induction period of photosynthesis and light respiration in green algae,** H. Gaffron (*Amer. Jour. Bot., 27 (1940), No. 4, pp. 204–216, figs. 2*).—Using pure cultures of *Scenedesmus* and *Chlorella*, the course of photosynthesis was studied during the induction period in plants first subjected for some hours to darkness and anaerobiosis. On illumination in the absence of oxygen, photosynthesis started immediately and at an abnormally high and quickly varying rate. These changes in rate were accompanied by very significant divergencies of the assimilatory quotient from the supposedly constant value of unity. These measurements are taken as proof of the existence of oxidation reactions inside the assimilatory mechanism. Production of 1 molecule of $O_2$ in photosynthesis would be the result of reduction of 1 molecule of $CO_2$ only if no such reaction was interfering. The rapid interception of the $O_2$ of photosynthesis by reducing substances appears to depend on a special "reduced" state in the assimilatory mechanism. Another kind of light or photooxidation occurs in the chloroplast at high light intensities in the presence of free $O_2$. Here molecular $O_2$—instead of, or in addition to, the "photoperoxides"—is consumed in oxidation reactions, which again differ from the normal dark respiration. It remains to be seen whether or not the consumption of photoperoxides and the absorption of molecular $O_2$ in the light are caused by the same catalytic mechanism.

There are 25 references.

**Carbon dioxide reduction with molecular hydrogen in green algae,** H. Gaffron (*Amer. Jour. Bot., 27 (1940), No. 5, pp. 273–283, figs. 3*).—Oxygen and $CO_2$ are the only gases participating in large amounts in the metabolism of green plants. It has now been found that the algae *Scenedesmus* and *Rhaphidium* can activate and utilize molecular H, normally inert for all plants. Incubated in H for a few hours in the dark, these algae absorb it in connection with several metabolic processes, and reduce metabolites as well as $O_2$ provided the latter is given in low concentrations. Even more important seems the reduction of $CO_2$ with H in the light. The photosynthetic quotient, $-H_2/-CO_2$, is 2, as in the purple bacteria, and this similarity is said to be more than superficial. The studies reported show that the hydrogenase system in *Scenedesmus* reacts directly with the intermediate photoperoxides of photosynthesis, no $O_2$ being liberated. The rate of $CO_2$ reduction with H was proportional to the light intensity and at constant intensity, with both reactants in excess, the reaction proceeded at a constant rate, but if the light exceeded a certain limit H absorption stopped, and after a few minutes normal photo-

synthesis came into full activity with $O_2$ production. Apparently a formation of surplus intermediate photoperoxides brings the system from a reduced into an oxidized state. In this aerobic state the splitting of photoperoxides leading to $O_2$ liberation is the preferred reaction. There are 27 references.

**The synthesis of sucrose by excised blades of sugar cane: Time and temperature,** C. E. Hartt (*Hawaii. Planters' Rec.* [*Hawaii Sugar Planters' Sta.*], *44* (*1940*), *No. 2, pp. 89–116, figs. 9*).—Evidence for sucrose synthesis by sugarcane leaf blades from simple sugars has been previously noted (E. S. R., 77, p. 462). Continuing the investigation, it is here reported that supplying the blades with both glucose and fructose hastens and increases sucrose formation in darkness, as compared with supplying only one of the simple sugars. Detached blades continued to form sucrose from glucose for nearly 2 weeks, reaching over 16 percent cane sugar on the dry weight basis. Temperature affected the absorption of simple sugar, the interconversion of glucose and fructose, and the formation of sucrose. Absorption of simple sugar was much the same at 6° and at 20° C., but was considerably increased at 20°–40°. The interconversion of glucose and fructose failed to occur at 6°, it kept pace with sucrose formation at 20°, and at 30°–40° it was increased. The optimum temperature for sucrose formation proved to be 30°. The temperature coefficients obtained suggest that absorption at 6°–20° is a purely physical process, but at 20°–40° absorption was limited by a chemical reaction. However, sucrose synthesis was limited by a chemical reaction at the lower but by a physical process at the higher temperatures. The evidence is believed to indicate that the simple sugars are fleeting intermediates in the leaf and that cane sugar is a storage product.

**Photoperiodism in the plant kingdom,** R. O. Whyte and M. A. Oljhovikov (*Chron. Bot., 5* (*1939*), *No. 4–6, pp. 327–331*).—This is a critical review (with 29 references) and discussion of the present status of the subject.

**Yellowing and dying of leaves in soya as related to daylength,** G. M. Psarev (*Compt. Rend.* (*Dok.*) *Acad. Sci. U. R. S. S., n. ser., 25* (*1939*), *No. 8, pp. 679–682*).—The author reports that in soybean plants under short days aging and yellowing of the leaves are delayed, but that there are varietal differences in this response which may be useful in selection for breeding purposes.

**The protein and fat problem in German agricultural-chemical investigation** [trans. title], K. Schmalfuss (*Chron. Bot., 5* (*1939*), *No. 4–6, pp. 378, 379*).—A brief review of data on protein and oil formation as influenced by plant nutrition.

**A phytosociological study of an evergreen oak forest in the vicinity of New Orleans, Louisiana,** W. T. Penfound and J. A. Howard (*Amer. Midland Nat., 23* (*1940*), *No. 1, pp. 165–174, figs. 5*).—Evergreen oak forest is characteristic of alluvial ridges in this area. The forest studied was young (50 yr.), the crown cover ±55 percent, and the basal area 96 sq. ft. The dominant trees averaged 69 ft. in height and 15 in. in diameter. Water oak (*Quercus nigra*) and live oak (*Q. virginiana*) were the dominant trees. Distinctive characteristics of the forest were the widespreading live oaks with their mantle of Spanish moss, a shrub layer in which dwarf palmetto (*Sabal louisiana*) was the only common species, and the abundance of oak forest grass (*Oplismenus setarius*) in the herbaceous stratum.

**The ecology of the larger fungi.—IV, The seasonal frequency of grassland fungi with special reference to the influence of environmental factors,** W. H. Wilkins and S. H. M. Patrick (*Ann. Appl. Biol., 27* (*1940*), *No. 1, pp. 17–34, figs. 5*).—The experimental methods of recording temperature, rainfall, soil water, and pH of a given area on each of three grassland stations over

a 12-mo. period are given, together with lists showing the seasonal distribution of the fungi on these three areas. The relation between temperature and water content of the soil and the numbers of fungus sporophores throughout the year was examined critically, and it is suggested that the summer and fall fungus seasons are conditioned by these factors. An alphabetical list of species showing their seasonal frequency is given. The seasonal distribution of individual species of fungi and the effect of these species in determining the mycological floras characteristic of the summer and fall seasons are discussed. The main point made by this study appears to be that the seasonal variation of the fungi of grasslands is conditioned by environal factors, and it is believed reasonable to assume that probably the same factors are also responsible for the seasonal variation of fungi in any other habitat or vegetation community.

**A study of the root system of the beech in woodland soils, with especial reference to mycorrhizal infection,** J. L. Harley (*Jour. Ecol., 28 (1940), No. 1, pp. 107–117, fig. 1*).—The results of this study of the root systems and mycorhizal relations of beech in three soil types indicated that mycorhizal infection is more abundant on poor soils where the C : N ratio remains high, and the rates of mobilization of nitrogenous material and nitrification are low. Studies of the mineral make-up and of other micro-organisms in these soils made it apparent that the extent of mycorhizal formation is a function of the soil system, i. e., that mycorhizas are an integral part of it. Variations in the vigor of beech growth on the soils investigated indicated that where mycorhizas are abundant the tree vigor is poor; where they are few, trees of the same order of vigor are found; whereas in intermediate soils, in which mycorhizas are present but not in great abundance, trees of the greatest vigor occur. These variations in vigor are not attributed primarily to differences in mycorhizal equipment or conditions affecting mycorhizal formation, but to the available rooting depth of the soil. Furthermore, analyses of buds and leaves indicated that nitrogenous substances are apparently more available in escarpment soils, which have high rates of N mobilization and fewer mycorhizal roots than in raw humus soils which have slow N mobilization and large numbers of mycorhizal roots. The effect of the mycorhizas on N absorption does not therefore equalize the availability of this element on these two widely differing soils.

**Radioactive nitrogen in the study of $N_2$ fixation by non-leguminous plants,** S. Ruben, W. Z. Hassid, and M. D. Kamen. (Univ. Calif.). (*Science, 91 (1940), No. 2372, pp. 578, 579*).—Using barley plants and radioactive nitrogen, apparently positive evidence for nitrogen fixation was obtained.

**Macrosporogenesis and embryology of Portulaca oleracea,** D. C. Cooper. (Wis. Expt. Sta.). (*Amer. Jour. Bot., 27 (1940), No. 5, pp. 326–330, figs. 38*).—This study follows in detail the differentiation of an archesporial cell from a single apical hypodermal cell, division of the former into a primary parietal cell and a primary sporogenous cell, which functions directly as a macrospore cell, and so on through to the fully developed embryo, which forms a well-defined arc in the mature campylotropous seed.

**Developmental studies with Brassica seedlings,** A. L. Havis. (Ohio Expt. Sta.). (*Amer. Jour. Bot., 27 (1940), No. 4, pp. 239–245, figs. 7*).—In the hypocotyl of kohlrabi seedlings the point of maximum growth was found to progress upward from the base to the cotyledonary node, with cell division persisting longest near the node. Cell elongation occurred during and after cell division. The number of epidermal cells increased very little during hypocotyl elongation. The outer cortical layer was the last to cease division in any given time region and in the hypocotyl as a whole. There was a trend toward increasing division progressing from the outermost to the innermost cortical cells. The rate of cell

division was evidently not highest in the region of most rapid elongation. Usually, only cell elongation was taking place where the growth was most rapid. There was a definite tendency for all cells in any given layer to reach the same length at maturity. There was no increase in radius of the epidermis or cortex during hypocotyl development. The factors inducing differential growth rates in these seedlings are not yet known. Several drastic seedling treatments tried failed to change the constant growth relations described.

**Investigations of the early developmental period of the young cereal plant** [trans. title], K. ZIJLSTRA (*Dept. Econ. Zaken [Netherlands], Verslag. Landbouwk. Onderzoek., No. 45 (17) A (1939), pp. 439–493, pls. 2, figs. 12; Ger. abs., pp. 492, 493*).—This monograph presents the results of a study of the morphological-developmental stages of the germinating seed and young seedling in the small grains.

***Studies on the developing cotton fiber.*—I, Relation of development of crude cotton fiber to the other principal boll constituents**, J. COMPTON and F. E. HAVER, JR. (*Contrib. Boyce Thompson Inst., 11 (1940), No. 2, pp. 105–118, figs. 3*).—In a study of the relationship between certain basic components of the developing cotton fiber those arbitrarily chosen were dry fiber residue, reducing sugars in the fiber, fats and waxes soluble in alcohol-benzene, and total fiber moisture. In Coker Super Seven (*Gossypium hirsutum* strain 4), other than the slower rate of maturation and higher moisture content of the fibrous greenhouse material no essential differences seemed to exist between the ratios of the wet crude fiber constituents of bolls grown under field and greenhouse conditions. During the period of active fiber development the ratio, dry crude fiber: reducing sugars; waxes, on a constant-moisture basis, varied as follows: As the dry crude fiber mass increased the reducing sugars decreased, whereas the extractable fats and waxes remained practically constant. There are 18 references.

**Lamellate structure of cellulose membranes in cotton fibers**, F. L. BARROWS (*Contrib. Boyce Thompson Inst., 11 (1940), No. 2, pp. 161–179, figs. 4*).—In studying cellulose membrane development from the day of flowering to maturity in the epidermal seed coat hairs of a genetically pure line of *Gossypium hirsutum* (var. Super Seven), it was found that the fiber contains cellulose particles laid down in successive lamellae, thus gradually increasing the thickness of the wall. The number of lamellae at the base and tip varied in fibers on the same seed, the larger number of lamellae being at the base of the older fibers. There was no evidence found to correlate these lamellae with the so-called daily "growth rings." The lamellae were of remarkably uniform thickness ($\pm 1\mu$), whether grown under daylight in the greenhouse or under continuous light. The microscopical and microchemical evidence indicated that each lamella consists of a single layer of cellulose particles held together by a colloidal cementing substance. X-ray diffraction patterns of fibers developed under continuous light and under daylight in the greenhouse showed the same general type of structure with only slight differences in orientation and amounts of cellulose. There are 61 references.

**Contributions to the study of the cell wall.—I, Methods for demonstrating lignin distribution in wood**, H. E. DADSWELL and D. J. ELLIS (*Jour. Council Sci. and Indus. Res. [Austral.], 13 (1940), No. 1, pp. 44–54, pls. 4*).—In this survey, normal and compression woods of numerous conifers and a wide range of tropical and temperate dicotyledonous woods, many Australian, were used. The methods involved treatment of thin cross and tangential sections with 72-percent $H_2SO_4$. In some cases the sections were pretreated with a solution of I in KI. Gentle warming of the slide proved essential for revealing the cell wall patterns clearly, though species varied in clearness. The degree

of lignification indicated by the cell wall lignin pattern was correlated with that supposedly revealed by staining reactions using safranine and light green. In species where a lignin pattern was observed in cross section, the pattern was predominantly radio-concentric in nature. Exceptions to this were found with compression wood tracheids and anomalous fibers from several dicotyledonous woods. The importance of this work as a starting point for various investigations is stressed.

**Experimental cytology, H. H. Pfeiffer** (*Experimentelle cytologie. Leiden: Chron. Bot. Co., 1940, pp. XII+248, figs. 28*).—This is a monographic text of the subject, with particular reference to the plant kingdom.

**Cytoplasmic behavior during division of vacuolate plant cells, E. W. Sinnott and R. Bloch** (*Natl. Acad. Sci. Proc., 26 (1940), No. 4, pp. 223–227, fig. 1*).—Study of cell division in vacuolate plant cells indicated that from very early prophase the cytoplasm tends to become aggregated into a plate of more or less fused strands, the phragmosome, which occupies the position of the future cell wall. The fact that the entire cell body rather than the nucleus alone appears concerned in establishing the plane of division and the location of the new wall is deemed of general importance for developmental problems.

**The cytology of sporangium development in Azolla filiculoides, R. E. Duncan.** (Univ. Maine). (*Bul. Torrey Bot. Club, 67 (1940), No. 5, pp. 391–412, figs. 30*).—This is a contribution to the life history of this salviniaceous plant.

**The Merton catalogue: A list of the chromosome numerals of species of British flowering plants, P. F. Maude** (*New Phytol., 38 (1939), No. 1, pp. 1–31*).—The threefold purpose of this list is to provide the systematist with a new instrument in classifying and determining the species of British flowering plants, the cytologist with the references to chromosome studies on these species and indications as to the work still remaining to be done, and the naturalist with the means of understanding the conformities and unconformities of chromosome number underlying the classification of these plants by their external form into species and larger groups. The data are arranged by families, genera, and species. Over eight pages of references are provided.

**Chromosome numbers in some British plants, P. F. Maude** (*New Phytol., 39 (1940), No. 1, pp. 17–32, figs. 10*).—New chromosome counts are given for 74 species of British plants.

**Stem anatomy of chaparral shrubs, K. S. Watkins.** (Univ. Calif.). (*Bot. Gaz., 101 (1939), No. 2, pp. 391–402, figs. 14*).—The author presents a comparative study of the stem anatomy of 10 species dominant in the chaparral formation of southern California. There are 31 references.

**The seed of the spider lily, Hymenocallis occidentalis, M. R. Whitehead and C. A. Brown.** (La. State Univ.). (*Amer. Jour. Bot., 27 (1940), No. 4, pp. 199–203, figs. 13*).—A study of the morphology and development of the seed and plant.

**Fruits and seedlings of Ceratophyllum, W. C. Muenscher.** (Cornell Univ.). (*Amer. Jour. Bot., 27 (1940), No. 4, pp. 231–233, figs. 2*).—The fruits and seedlings of *C. demersum* and *C. echinatum* are described. The seedling of *C. demersum* agreed with the description of seedlings based on European material, while that of *C. echinatum* differed in not developing simple leaves on the lower nodes.

**On the classification of actinomycetes, S. A. Waksman.** (N. J. Expt. Stas.). (*Jour. Bact., 39 (1940), No. 5, pp. 549–558*).—The accumulating knowledge on the morphology of the Actinomycetales is believed to lead more and more to a recognition that its members constitute an independent group of organisms closely related to the bacteria through some of its constituent forms, but which

has adopted a funguslike form of growth. The mode of growth and spore formation of these organisms are described, and the various proposals that have been made for their classification are reviewed. It is concluded that each of these systems has some favorable characteristics but tends to give undue emphasis to certain particular groups. The author proposes a system in which an attempt is made to meet these limitations, to indicate the relationship of the various constituent groups to the true bacteria, and to include forms not considered by the other authors. Owing to the great variability and abundance of transition forms among the actinomycetes, the term "species" is applied more in the sense of "species groups." However, certain type species may be established, around which the closely related forms may be grouped. The various genera among the Actinomycetales form a natural group of micro-organisms with a variety of transitional forms. A characterization of the group and its main subdivisions and a key for the classification of the order are presented. The genera *Mycobacterium* and *Corynebacterium* are included under the family Mycobacteriaceae, *Cohnistreptothrix* and *Proactinomyces* under the Proactinomycetaceae, *Actinomyces* under the Actinomycetaceae, and *Micromonospora* under the Micromonosporaceae.

**Relation between temperature growth range and size in the genus Bacillus,** C. LAMANNA. (Cornell Univ.) (*Jour. Bact., 39 (1940), No. 5, pp. 593–596*).—From a 3-yr. study of 105 cultures of aerobic, nonthermophilic, spore-forming rods of the genus *Bacillus*, it is concluded that the large-celled species have lower minimum and maximum temperatures of growth than the small-celled species.

**Description of a dextro-lactic acid forming organism of the genus Bacillus,** A. A. ANDERSEN and C. H. WERKMAN. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 14 (1940), No. 2, pp. 187–193, pl. 1*).—A spore-forming organism producing large amounts of *d*-lactic acid was isolated and is described as *B. dextrolacticus* n. sp.

**Sensitivity of Escherichia coli to cold-shock during the logarithmic growth phase,** C. P. HEGARTY and O. B. WEEKS. (Oreg. State Col.). (*Jour. Bact., 39 (1940), No. 5, pp. 475–484, figs. 3*).—The sensitivity of *E. coli* to cold shock appeared to be related in some manner to cell division and to changes within the individual cell.

**The adaptive production of enzymes by bacteria,** R. J. DUBOS (*Bact. Rev., 4 (1940), No. 1, pp. 1–16*).—A critical review (87 references). Certain substances increase the yield of a given enzyme by contributing the necessary molecules for its synthesis. In other cases production of a given enzyme is greatly stimulated when the substrate attacked is a constituent of the culture medium. All available evidence indicates that the production of these adaptive enzymes involves the synthesis of new protoplasm. It is suggested that the synthetic process, so to speak, is oriented or guided by the chemical structure of the subtrate which thus determines the specificity of the enzyme. Adaptive enzymes exhibit a remarkable specificity toward the subtrates which have stimulated their production, and it is believed, therefore, that they will serve as useful tools in the analysis of many biological and biochemical problems.

**Preparation of an active juice from bacteria,** W. P. WIGGERT, M. SILVERMAN, M. F. UTTER, and C. H. WERKMAN. (Iowa State Col.). (*Iowa State Col. Jour. Sci., 14 (1940), No. 2, pp. 179–186, fig. 1*).—"A technic for the preparation of active cell-free glucolytic enzymes based on the use of powdered glass in the proper proportions for the disruption of the bacterial cell is described. Juices active on mixtures of hexosediphosphate and glucose have been prepared from *Aerobacter indologenes*, *A. aerogenes*, *Escherichia coli*, *Citrobacter freundii*,

and *Clostridium butylicum*. Various dehydrogenases have been detected in juices of *A. indologenes*."

**Acetylmethylcarbinol enzyme-system of Aerobacter aërogenes,** M. Silverman and C. H. Werkman. (Iowa State Col.). (*Soc. Expt. Biol. and Med. Proc., 43 (1940), No. 4, pp. 777, 778*).—Using the technic of Wiggert et al. (see above), an enzyme preparation was extracted from cells of *A. aerogenes*, apparently possessing no hydroclastic activity but capable of converting pyruvic acid into $CO_2$ and acetylmethylcarbinol. The presence of inorganic phosphate was found essential for pyruvate break-down by this enzyme preparation.

## GENETICS

**Mammalian genetics,** W. E. Castle (*Cambridge, Mass.: Harvard Univ. Press, 1940, pp. VIII+169, [pls. 40], figs. 17*).—Following the principles of genetics and the laws developed, a summary is given of present knowledge of the inheritance of characters in mammals. Special consideration is given to those characters of practical importance.

**[Papers on genetics, reproduction, and lactation in dairy cattle]** (*Jour. Dairy Sci., 23 (1940), No. 6, pp. 530–533, 534–536, 537, 538, 540–543, 544–550, 576–579*).—In addition to papers noted elsewhere (see p. 672), brief abstracts are given of the following reports presented at the 1940 meeting of the American Dairy Science Association: The Storage of Dairy Bull Spermatozoa, by H. A. Herman and E. W. Swanson (pp. 530, 531) and Some Observations on the Morphological Variations in the Spermatozoa of Dairy Bulls, by E. W. Swanson and H. A. Herman (pp. 531, 532) (both Mo. Expt. Sta.); Fecundity and Certain Other Characteristics of Fresh and Stored Bovine Semen, by H. P. Davis, G. W. Trimberger, and G. K. L. Underbjerg (pp. 532, 533) (Univ. Nebr.); An Assay Method for Thyrolactin, by W. W. Heathman and C. W. Turner (pp. 534, 535) and Thyrolactin, a New Source of Thyroxine for Dairy Cattle, by C. W. Turner (pp. 535, 536) (both Mo. Sta.); The Effect of Thyroxine Injections on the Physiological Processes of Dairy Cattle, by V. Hurst, R. P. Reece, and J. W. Bartlett (p. 536) (N. J. Stas.); Effect of Post-Hypophyseal Extract on Lactation in Hypophysectomized Post-Gravid Rats, by E. T. Gomez (pp. 537, 538) (U. S. D. A.); The Hormone Control of Mammary Duct Growth, by A. A. Lewis (pp. 540, 541) and The Mammogenic Lobule-Alveolar Factor of the Anterior Pituitary, by J. P. Mixner (pp. 542, 543) (both Mo. Sta.); A Study of Some Methods for the Prediction of Butterfat Percentage in Herds of Ayrshire Cattle, by G. A. Bowling and D. N. Putnam (pp. 544, 545) (W. Va. Sta.); The Use of Cellular Antigens in the Blood of Cattle for Determining Parentage, by L. C. Ferguson and M. R. Irwin (pp. 545, 546) (Univ. Wis.); Effects of Inbreeding in Dairy Cattle (Progress Report), by G. E. Dickerson (pp. 546, 547) (Wis. Sta.); Results of Twenty Years Work on Proving Bulls at the Huntley, Montana, Field Station, by R. R. Graves, J. R. Dawson, and D. V. Kopland (p. 547) (U. S. D. A.); Average Useful Life-Span, and Causes of Losses of Dairy Bulls, by R. B. Becker and P. T. D. Arnold (p. 548) (Fla. Sta.); The Inheritance of the Solids-Not-Fat Percentage in Dairy Cattle, by H. C. Moore and K. S. Morrow (pp. 548, 549) (N. H. Sta.); Some Factors Affecting Breeding Efficiency in Dairy Cattle, by R. E. Erb, J. W. Wilbur, and J. H. Hilton (p. 549) (Purdue Univ.); Early Recognition of the Freemartin Condition in Heifers Twin-Born With Bulls, by W. W. Swett, C. A. Matthews, and R. R. Graves (p. 550) and The Nation-Wide D. H. I. A. Proved-Sire Program, by J. F. Kendrick (pp. 576, 577) (both U. S. D. A.); The Importance of Selective Registration to the Dairy Industry, by L. Copeland (p. 577); and Utilization of Proved Sires and Sons of Proved Sires, by F. Arnold (pp. 578, 579) (Iowa State Col.).

**Color genes in Holstein-Friesian by Brown Swiss crosses, R. J. Bushnell** ([Conn.] Storrs Expt. Sta.). (*Jour. Hered., 31 (1940), No. 5, pp. 252–256, figs. 3*).—In crosses of Holstein-Friesian ♀♀ with Brown Swiss ♂♂ there were produced 4 dun ♂♂ and 8 dun ♀♀, 2 black ♂♂ and 4 black ♀♀, and 1 reddish-brown ♀. It is concluded that the color genotype of the Brown Swiss was *bbiiWWininSSbrbr*, with *Bs* and *D* heterozygous or homozygous dominant. The whitening gene (*W*) of Holstein-Friesians was expressed in the absence of black. Some Holstein-Friesians carried a white star gene (*Ws*) but not the brindling gene (*Br*).

**Contribution to the genetics of colour and spotting in the goat, E. V. Eydrigevich** (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 25 (1939), No. 9, pp. 784–786, figs. 6*).—From observations on color and spotting in Kirghiz goats it is pointed out that white is epistatic to other colors. Fawn coat color in its several variations from white to fawn is epistatic to black. Dappled black was found to be epistatic to solid black. Gray varied from dark gray to light gray to white and was epistatic to black and hypostatic to white and fawn. Red was also epistatic to black and hypostatic to white and fawn. Spotting was dominant to the solid colors.

**"Streamlined" pigs—a new legless mutation, L. E. Johnson.** (Iowa Expt. Sta.). (*Jour. Hered., 31 (1940), No. 5, pp. 239–242, figs. 2*).—Among 112 Poland China pigs sired in 7 litters by 1 boar bred to daughters of another presumably closely related boar there were 15 legless pigs. In subsequent litters by some of the same sows bred to the same boar there were produced 60 pigs, of which 7 pigs in 3 litters showed the legless defect. Considering the different facts about the occurrence of the abnormal pigs, the condition seemed to be due to a recessive gene.

**Genetics of the fowl.—XI, A linkage map for six chromosomes, F. B. Hutt and W. F. Lamoreux.** (Cornell Univ.). (*Jour. Hered., 31 (1940), No. 5, pp. 231–235, figs. 2*).—In continuation (E. S. R., 83, p. 181), the six linkage groups in the fowl previously noted by title (E. S. R., 82, p. 610) are described and illustrated. Attention is called to the more recent additions to the chromosome map in the fowl and especially the need for clarifying the relationship of *B* (barring) and *Id* (inhibitor of dermal melanin), at one end of the sex chromosome, and *S* (silver) and *K* (slow feathering), located at its other end.

**A study of fecundity in the domestic fowl: The behaviour of persistency in individual hens, A. W. Greenwood, J. S. S. Blyth, and N. Galpin** (*Jour. Agr. Sci. [England], 30 (1940), No. 2, pp. 202–209, fig. 1*).—Records of the last egg laid by 269 hens in the Brown Leghorn flock of the Institute of Animal Genetics, Edinburgh, were furnished to supply evidence of inheritance. Different birds varied in laying the last egg from July 22 to December 31. One-fourth of the population was found to differ by not more than 6 days in the dates of last egg in the first and second years, but more than half differed by more than 13 days. From the analysis of variance it was evident that the date of cessation of production at the end of the pullet year was not a reliable indication of the bird's potentiality in this respect, but the true date was more closely approximated the longer the birds were kept. The termination of the cycles of the birds over such a wide range showed that multiple factors operated or that the genes showed a considerable range of expression.

**Breed determined differences in blood indices of fowls, O. N. Kitaeva** (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 25 (1939), No. 4, pp. 304–307*).—The number of erythrocytes, hemoglobin content, and blood alkalinity in several breeds of fowls increased with age, but the size of the erythrocytes decreased. In general, ♂♂ showed higher blood values than ♀♀, and the

larger breeds of fowls showed higher hemoglobin contents and more erythrocytes than medium and small breeds.

**Research on frizzle plumage in the Rumanian fowl** [trans. title], G. K. Constantinesco and V. Derlogea (*Sci. Genet., 1 (1939), No. 2–3, pp. 219–227, figs. 6; Lat., Eng., Ger. abs., p. 227*).—Frizzle plumage in the local breed in Rumania and southeastern Europe behaved as dominant to normal. Contrary to findings of Landauer and Dunn (E. S. R., 65, p. 523), the homozygous condition was not lethal, but homozygotes were more extremely frizzled. $F_2$ and backcross ratios closely approximated expectations in several matings.

**Brachydactyly and syndactyly in ptilopod domestic fowl, Gallus domesticus**, R. G. Jaap. (Okla. Expt. Sta.). (*Okla. Acad. Sci. Proc., 19 (1939), pp. 27–29*).—In the fowls hatched during 2 yr., only 2 out of 161 ptilopod chicks were free of any evidence of brachydactyly or syndactyly. Among 5,000 nonptilopod individuals, no cases of brachydactyly or syndactyly and only about 1 percent of slight leg feathering were observed. From an analysis of the characters of the progeny from matings of Brahmas the indications were that brachydactyly, syndactyly, or ptilopody result from the action of the same genes but that the final expression is apparently produced by modifying factors the exact physiological mechanics of which were not worked out.

**The endocrine system and plumage types, II–V** (*Jour. Genet., 39 (1940), No. 3, pp. 485–524, pls. 6, fig. 1*).—In continuation of this series (E. S. R., 79, p. 617), four papers are presented as follows:

II. *The effects of thyroxin injections to normal, caponized, and thyroidectomized caponized birds*, C. W. Emmens and A. S. Parkes (pp. 485–492).—Daily injections in the breast muscles of 0.5 mg. of thyroxine were found to replace the normal and hyperthyroid feather types in Silver-Gray Dorking, Barnevelder, and Ancona capons and Sebright cocks and hens. The results fully confirmed the earlier study in the series on barbule formation as a result of thyroxine injection. Lack of thyroxine produced fringed feathers, but in no cases were the feathers of thyroxine-injected birds markedly fringed. Loss of melanin occurred in thyroidectomized Sebrights. In birds with normally white-tipped feathers the tip was extended by thyroid injection. In general, melanin formation was stimulated. The increased white tipping in Ancona and Speckled Sussex from thyroxine was thought to be indicative of a low threshold level. The more rapidly growing feathers or parts of feathers were most sensitive to specific effects.

III. *Further experiments on the relation between the thyroid gland and plumage patterns in domestic fowls and ducks*, J. P. Chu (pp. 493–501).—The effects of thyroidectomy and thyroid feeding on feather type and color in Silver Duckwing Game Bantams, Partridge Game Bantams, and Barred, White, and Silver-Black Plymouth Rocks were investigated. The different species reacted somewhat differently, and these results are discussed. Modifications in feather structure were noted in Plymouth Rocks, and modifications in color occurred, especially in Duckwing Bantams and mallard ducks, both in ♂♂. Sex dimorphic plumage was intimately related to thyroid-gland endocrines.

IV. *Feminization of plumage, with especial reference to henny cocks and eclipse drakes*, C. W. Emmens and A. S. Parkes (pp. 503–515).—Castration of henny dark-gray and Duckwing Old English Game cocks caused elongation in the saddle hackle feathers. Injection of testosterone propionate induced both quantitative and qualitative breed and sex differences in the responses. Injection or implantation of testosterone into Silver Campine capons induced inhibition and slowing in the development of plucked saddle feathers. Large doses of testosterone into Brown Leghorn and Duckwing Bantam capons produced effects of thyroid deficiency, but similar results were produced in hen-

feathered breeds with low doses. The appearance of eclipse plumage in mallard drakes was inhibited by castration before the end of April, but if castration was delayed until after eclipse plumage formation started, the plumage formation continued. Testosterone did not affect characters of the castrated mallard plumage, but oestrone produced a type of feminization intermediate between nuptial and eclipse plumage.

V. *The production of eclipse plumage in the mallard by injection of anterior pituitary extract and dehydroandrosterone*, J. P. Chu (pp. 517–524).—Feather samples which grew after plucking individual feathers on two mallard drakes after injections with sheep pituitary powder showed eclipse characters as a result of considerable hypertrophy of the testes. Feathers regenerated about 10 days after plucking from ♂ and capon mallards which had received 5 mg. of crystalline dehydroandrosterone for 20 days were typically eclipse.

**Sex determination of day-old chicks**, T. H. Canfield. (Univ. Minn.). (*Poultry Sci.*, *19* (*1940*), *No. 4*, *pp. 235–238*, *figs. 4*).—The Japanese method of sexing day-old chicks is described, and the ♂ and ♀ types of external sex organs are illustrated.

**A recessive slate plumage color of turkeys**, V. S. Asmundson. (Univ. Calif.). (*Jour. Hered.*, *31* (*1940*), *No. 5*, *pp. 215–217*, *figs. 2*).—Mating of a slate ♀ with a Bronze ♂ produced 151 nonslate and 45 slate progeny in the $F_2$ generation. Mating slate ♀♀ with nonslate ♂♂ produced in the $F_2$ and backcross generations close approximations of the 3:1 and 1:1 ratios expected. These results suggest that slate is due to a simple autosomal gene recessive to nonslate. The Bronze color gene *R*, when present in slates, caused barring of the flight feathers and penciling in the tail feathers. The Bourbon Red gene *r*, when homozygous, produced nearly white, nonbarred flight feathers and nonpenciled tail feathers in genotypic slates.

**Some experimental matings of color-bred white bull terriers**, L. C. Briggs (*Jour. Hered.*, *31* (*1940*), *No. 5*, *pp. 236–238*, *figs. 2*).—Observations on several litters showed matings of both white parents, regardless of ancestral color, to produce only white pups, indicating the recessive nature of white. Citation is made of only one litter showing irregularity in this respect.

**An independent recurrence of the blue mutation in the Norway rat and a blue-black mosaic**, M. R. Curtis and W. F. Dunning (*Jour. Hered.*, *31* (*1940*), *No. 5*, *pp. 219–222*, *figs. 2*).—A blue-black hooded mosaic ♀ was observed in the $F_2$ population of a cross of intense hooded × self blue, a recessive character described by Roberts (E. S. R., 62, p. 822). The mosaic was attributed to a somatic mutation of blue to black, the opposite of that which happened in the germ cell in the origin of the blue mutation. This resulted in an intense black area in the blue hood on the left shoulder and a less clearly defined black area on the right side of the face. The mosaic mated to a blue-selfed ♂ produced only blue-selfed progeny. The mosaic was genotypically homozygous dilute.

**Breed, age, and sex variations in blood value of rabbits**, K. B. Alperovich (*Compt. Rend.* (*Dok.*) *Acad. Sci. U. R. S. S.*, *n. ser.*, *25* (*1939*), *No. 5*, *pp. 410–413*).—Age and breed variations in large and small breeds of rabbits and $F_1$ crosses between them showed that high hemoglobin values and the diameter of the erythrocytes observed in young rabbits were gradually reduced until the animals were about 2 mo. of age, after which the blood values increased. These increases were usually higher in ♂♂ than in ♀♀. The larger breeds had a higher hemoglobin value and a smaller number of erythrocytes than smaller rabbits. The $F_1$ ♂♂ were intermediate between parents, but the hemoglobin values and erythrocyte counts were greater than in their full-blooded ♀ parents.

**Gonadotropic hormone in the non-pregnant mare,** H. H. COLE and H. GOSS. (Univ. Calif.). (*Amer. Jour. Physiol., 127 (1939), No. 4, pp. 702–709*).—Samples of between 2 and 3 l. of blood were drawn every 4 to 7 days from non-pregnant thoroughbred and draft mares throughout the recurring oestrous cycles and tested on immature ♀ rats for the presence of gonadotropic hormone. The cycles of the mares and the concentration of the gonadotropic hormone in the serum of the same and different mares varied. Only rarely was a response obtained with less than the extract from 100 cc. of serum. The time of highest gonadotropic concentration seemed to be in metoestrum.

**Effect of estrogens and androgens alone and in combination with chorionic gonadotropin on the ovary of the hypophysectomized rat,** R. I. PENCHARZ. (Univ. Calif.). (*Science, 91 (1940), No. 2371, pp. 554, 555*).—Study is reported of the ovarian weight of immature rats in which were implanted pellets of oestrogens and androgens following hypophysectomy and Antuitrin-S injection. The most striking results were obtained in animals injected with diethylstilboestrol and Antuitrin-S (chorionic gonadotropin). From 130 to 170 μg. of diethylstilboestrol pellets were absorbed per day, as compared with from 40 to 63 μg. of the oestradiol dipropionate per day.

**Effects of testosterone propionate on pregnancy and on passage of ova through the oviducts of mice,** H. O. BURDICK, B. B. EMERSON, and R. WHITNEY (*Endocrinology, 26 (1940), No. 6, pp. 1081–1086, figs. 6*).—Daily doses of 5 mg. of testosterone propionate beginning after mating were found to cause retention of ova in the tube, whereas 0.025 mg. had no effect on pregnancy or passage of the ova. The ova were partly in the uterus and partly in the tubes in ♀♀ given doses of 0.5 and 2 mg. There was no evidence of retardation in blastocyst development except the degeneration resulting from tubal retention.

**The comparative assay of gonadotropic substances on rats, mice, and chicks,** J. S. EVANS, L. HINES, R. VARNEY, and F. C. KOCH (*Endocrinology, 26 (1940), No. 6, pp. 1005–1011, figs. 3*).—Comparison was made of the immature ♀ rat and mouse and day-old chick for assaying gonadotropic substances in sheep pituitaries, ♂ and menopause urine, and pregnant-mare serum. The results showed the mouse uterus to be 66 times as sensitive as the rat ovary and about 10 times as sensitive as the chick testis to injections of unfractionated pituitary extracts. The mouse uterus was also most sensitive to injections of pregnant-mare serum and the normal ♂ and menopause urine preparations. The response of the chick testis to ♂ urine and menopause urine was doubtful.

**Clinical and experimental observations on reproduction in the mare,** F. T. DAY (*Jour. Agr. Sci. [England], 30 (1940), No. 2, pp. 244–261, fig. 1*).—Observations are reported on the oestrous cycles of 8 pony mares from early spring until pregnancy ensued in the summer. Study was made on changes in the ovary and on time of ovulation, clinical examination of the developing fetus, and changes in the oestrous cycle following injections of gonadotropic hormones. The oestrous periods were determined by trying the mares daily with vasectomized stallions. Vaginal examination with a speculum was made of the developing fetuses. Insemination was by artificial means. Oestrus in the spring usually varied from 11 to 20 days and in the summer from 7 to 8 days. Dioestrus ranged from 5 to 30 days, as determined by palpation. Ovulation did not occur in the early spring. Of 31 ovulations, 27 occurred within 48 hr. before the end of oestrus, 2 on the first day after, and 2 on the fourth and fifth days before the end of oestrus. Pregnancy was detected by rectal examination from 16 to 23 days after ovulation. In the 11 mares, doses of from 1,000 to 2,000 mouse or rat units of pregnancy-urine extract given intravenously induced ovulation in from 20 to 40 hr. in most mares, independent

of the time of the administration during the oestrous cycle. Artificial insemination was equally effective 24, 48, and 72 hr. before ovulation but was unsuccessful from 2 to 4 hr. after ovulation. The duration of oestrus was shortened when ovulation occurred. The gonadotropic hormone administration had, therefore, no deleterious effect on subsequent oestrous cycles.

**Experiments on the use of chorionic gonadotrophin (pregnancy urine extract) for the treatment of sterility in dairy cattle,** A. C. BOTTOMLEY, S. J. FOLLEY, and H. M. S. WATSON (*Jour. Agr. Sci. [England], 30 (1940), No. 2, pp. 235–243*).—Three sterile bulls with few motile sperm in their semen were found, after 2 intramuscular injections of 2 cc. of pregnancy-urine extract, to produce large numbers of sperm and were able to get cows in calf. Oestrus was induced in several cows, and calves were produced following injection intravenously and intramuscularly with from 3 to 5 cc. of pregnancy-urine extract. A total of 59 cows showing regular oestrus but failing to conceive were treated with 3 intramuscular injections of 2 cc. of pregnancy-urine extract at 2-day intervals. Pregnancy was induced in 57.6 percent of the treated animals but in only 6.9 percent of the untreated control cows. Treatment with Antuitrin-S at the time of service increased the fertility of cows showing regular oestrus but failing to conceive. The prevention of conception in such animals was attributed to the failure to ovulate and to deficiencies in the production of progesterone following ovulation.

**Effect of mare serum hormone on the male and female mouse,** W. F. STARKEY and J. H. LEATHEM (*Amer. Jour. Physiol., 127 (1939), No. 4, pp. 751–754, figs. 7*).—Immature, mature, and castrate ♂ and ♀ mice were injected for 10 days with 0.5 rat unit of hormone from mare serum, and study was made of the weights of the gonads and changes in the histology of the secondary sex organs. As much as ninefold increase in ovarian weight with good-sized follicles and uterine tissue was produced in 12- to 18-day-old mice. Ovarian weight was increased sixfold in 34- to 41-day-old mice. Ovaries of 78-day-old control mice averaged 9.4 mg., as compared with 26.7 mg. in injected animals. There was practically no effect of the treatment on testis weight or spermatogenesis in ♂♂, although in young animals growth of interstitial tissues was stimulated. Gonadectomized ♀♀ and ♂♂ showed no effects.

**Pregnancy diagnosis in mares by colorimetric estimation of estrogens,** S. KOBER (*Endocrinology, 26 (1940), No. 5, pp. 914, 915*).—Pregnancy in 3,597 mares was chemically diagnosed by the presence of oestrogen in the urine between 141 and 190 days after mating, with an error of less than 1 percent.

**Presence of a principle with progesterone-like activity obtained from a plant source,** G. DE SÜTÖ-NAGY (*Soc. Expt. Biol. and Med. Proc., 43 (1940), No. 4, pp. 674, 675*).—Replacement of 15 percent of the basic diet of rats with bean flour was found to inhibit the occurrence of normal oestrous cycles. Extraction of bean flour with a Soxhlet apparatus or with fat solvents removed the inhibiting factor. This factor was concentrated so that 1.7 percent was effective on subcutaneous injection. The extracted material seemed antagonistic to the oestrogenic hormone, and crude bean oil gave a specific test for progesterone. The progesteronelike principle was sensitive to heat, oxidative agents, and alkalies.

**Action of progesterone on the gonadotropic activity of the pituitary,** E. B. ASTWOOD and H. L. FEVOLD (*Amer. Jour. Physiol., 127 (1939), No. 1, pp. 192–198, fig. 1*).—Doses of 1.5 mg. of progesterone did not prevent the occurrence of pseudopregnancy after stimulation of the cervix electrically. However, 4 mg. of progesterone per day on 3 or 4 days largely prevented the occurrence of pseudopregnancy as a result of this stimulation. Injection of 0.1 mg. of pro-

alkali reaction of the vaginal tract before coitus and the results of experiments in sex control with animals are briefly presented.

**The endocrine literature of 1939,** H. M. Evans and B. Cowles. (Univ. Calif.). (*Endocrinology, 26 (1940), No. 5, pp. 906–912*).—A review of the numbers and sources of publications in 1939 of articles on endocrinology.

## FIELD CROPS

**[Field crops research in Florida].** (Partly coop. U. S. D. A., Ga. Coastal Plain Expt. Sta., et al.). (*Florida Sta. Rpt. 1939, pp. 4, 39–63, 153, 154, 157, 158, 159–165, 175, 177–179, 187, 188, 189, 194, figs. 5*).—Progress is reported from continued experimentation (E. S. R., 81, p. 200) at the station and substations by W. A. Carver, F. H. Hull, G. E. Ritchey, W. E. Stokes, W. A. Leukel, J. L. Stevens, J. P. Camp, J. D. Warner, R. M. Barnette, H. Mowry, R. E. Blaser, J. R. Neller, J. R. Beckenbach, W. T. Forsee, Jr., F. T. Boyd, T. Bregger, R. W. Kidder, F. D. Stevens, R. R. Kincaid, and W. M. Fifield, including breeding work with corn, sweet corn, oats, Napier grass, sugarcane, and peanuts; variety tests with corn, oats, sugarcane for sugar and sirup, potatoes, peanuts, cowpeas, soybeans, clover, lespedeza, and miscellaneous forage and pasture grasses and legumes and cover crops; strain tests with pearl millet, Napier grass, and white clover; production tests with ramie; fertilizer tests with sea-island cotton, corn, oats, sugarcane, potatoes, ramie, peanuts, sorghum, clover, redtop, Dallis grass, and carpet grass; a study of "chlorosis" in corn; field tests on effects of preceding crops, wastepond phosphate, legume inoculation, seed treatment, and sulfur dusting on runner peanuts; study of the development and deterioration of roots in relation to growth of pasture plants (Sudan grass) under different fertilizer and cutting treatments; response of corn and other crops to less common elements on Everglade peat and muck soils; composition factors affecting the value of sugarcane for forage and other purposes; water requirements of sugarcane; cultural tests with potatoes, soybeans, and peanuts; effect of interplanting corn with velvetbeans at various spacings; seed storage; comparative production of large grasses grown for silage; ensiling of grasses with and without molasses; germination of tobacco seed after 7 yr. in different types of storage, and tobacco plant bed fertilization; and crop rotation studies under Everglades conditions with corn, cotton, crotalaria, and Austrian winter peas, corn and runner peanuts rotating with crotalaria and with native cover crops, and corn in a 2-yr. rotation with crotalaria species and weeds or natural land cover.

Other pasture investigations dealt with the value of centipede grass pastures as affected by soil characteristics and other factors; the effect of fertilizers on yield, grazing value, chemical composition, and botanical make-up of pastures; eradication of weeds in tame pastures and methods of ridding land of objectionable growths and obstacles; forage nursery and plant adaptation studies and forage and pasture grass improvement, especially with Napier grass and woolly fingergrass; growth behavior and relative composition of range grasses as affected by burning and the effect of burning on maintenance of natural grass stands and upon the establishment of improved grasses; studies of pasture legumes, of Napier grass for pasture purposes, and of water pasture; methods of establishing permanent pastures under various conditions; and pasture studies on peat and muck soils of the Everglades.

**[Field crops experiments by the Georgia Coastal Plain Station, 1938].** (Partly coop. Ga. Expt. Sta., U. S. D. A., Univ. Ga., et al.). (*Georgia Coastal Plain Sta. Bul. 30 (1939), pp. 16–45, 78–81, 115–121, 127–130, figs. 9*).—Research with field crops again reviewed briefly (E. S. R., 81, p. 362) for 1938 and for dif-

ferent periods of years comprised variety tests with cotton, corn for yield and resistance to weevils, oats, wheat, rye, grain sorghum, sorgo, sweetpotatoes, perilla, peanuts, lespedeza, soybeans for seed and forage, cowpeas, velvetbeans, crotalaria, winter cover crops, pasture grasses, and miscellaneous summer forage crops; breeding work with corn, cotton, oats, peanuts, soybeans, and pasture grasses; fertilizer experiments with corn, oats, and peanuts; winter cover and green manure crops for cotton and corn; cultural (including planting) experiments with oats, wheat, peanuts, soybeans, velvetbeans, crotalaria, lespedeza, and winter cover crops; and development of sea-island cotton production. Fertilizer work dealt with formulas and carriers of nitrogen, phosphorus, and potassium with cotton and sweetpotatoes, and also with fertilizer placement for cotton and tobacco; nitrogen and potassium top dressings for cotton and sweetpotatoes; secondary nutrient elements for cotton and tobacco; boron, potash and sulfur relation, and acid, basic, and neutral fertilizer tests with tobacco; and ratios of organic : nonorganic nitrogen with sweetpotatoes. General recommendations on soils, varieties, plant beds, fertilizers, spacing and topping, and curing for flue-cured tobacco are also included. In addition to the above work with flue-cured tobacco, progress reports are made from research at the Shade Tobacco Substation near Attapulgus, Ga., including fertilizer formulas, with variations in nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, boron, chlorine, varying ratios of nutrients and of nitrogen carriers, rates of stable manure, and organic nitrogen and phosphorus carriers; and seed production.

**[Farm crops work in Mississippi]** (*Miss. Farm Res.* [*Mississippi Sta.*], *3* (*1940*), *No. 6, pp. 1, 2, 3–6, 7, figs. 4*).—The progress of experiments with farm crops is noted in Persian Clover Shows Advantage for Early Pasture, by H. W. Bennett (pp. 1, 7); Purpose of Cultivation Is To Control Weeds—Least Cost to Grower and Least Injury to Plants Are Main Objectives, by I. E. Hamblin (p. 2); and Legume Nitrogen for Cotton Production in the Yazoo-Mississippi Delta, by R. Kuykendall (pp. 3–6, 7).

**[Farm crops research in New Jersey]** (*New Jersey Stas. Rpt. 1939, pp. 21–26, 87, 88*).—Work with field crops (E. S. R., 82, p. 175) reported on briefly comprised breeding studies with corn, barley, alfalfa, and red and white clover; variety tests with corn (and hybrids), wheat, barley, potatoes, soybeans, alfalfa, and red and white clover strains; combinations for spring-sown hay crops; production of high-protein timothy through nitrogen fertilization; fertilizer tests with potatoes; comparison of lime-complete fertilizer and lime-phosphate-potash systems of pasture treatment, and palatability tests; and experiments on establishing and maintaining fine turf, including studies on lawn, soils, and durability of grasses.

**[Experiments with field crops by the Puerto Rico College Station]**, A. Roque, J. Adsuar, P. Richardson Kuntz, F. Chardón, C. J. Clavell, J. Pastor Rodríguez, E. Molinary Salés, F. Juliá, and F. Méndez (*Puerto Rico Col. Sta. Rpt. 1939, pp. 10–12, 13, 17, 18, 60, 61, 65–69, 73, 89, 92–96, 98, figs. 3*).—Agronomic studies (E. S. R., 81, p. 502) reported on from the station and the Isabela Substation included variety, irrigation, fertilizer, and green manuring (*Crotalaria striata*) tests, all with sugarcane; forage production of variously fertilized grasses; a staking test with yams and a seed piece test with yautias; an irrigation test with corn; fertilizer tests with beans, alfalfa, yautias, and cassava; breeding work with corn, cotton, beans, and sugarcane; and variety trials with sweetpotatoes, soybeans, beans, lupines, and legumes for cover crops and green manure.

**Varieties of oats, barley, and spring wheat in Nebraska**, T. A. Kiesselbach, O. J. Webster, and K. S. Quisenberry. (Coop. U. S. D. A.). (*Nebraska*

*Sta. Bul. 328 (1940), pp. 28, figs. 6).*—Yields and other agronomic data, reported from varietal tests with oats, barley, and spring wheat at Lincoln, North Platte, and Alliance, 1931–39, supplementing earlier studies (E. S. R., 52, p. 529; 65, p. 432; 68, p. 320), are reported with brief descriptions of important varieties. Recent changes in acreage among the spring small grains in Nebraska were a reduction in acreage of oats and increases in those of barley and spring wheat. Increases in spring wheat, likely temporary, seemed due to heavy abandonment of winter wheat in western Nebraska caused by drought. The increase in barley acreage is due to superior varieties and recognition of its higher productivity compared with oats.

Recommended varieties include oats: Brunker for central and western Nebraska, Iogold and Burt selection (Nebr. No. 518) for the southeastern section and in irrigated areas, and Burt selection (Nebr. No. 518) and Kanota for early seeding in central and northeastern Nebraska; barley: Spartan, Short Comfort, Trebi, and Club Mariout; and spring wheat: Thatcher and Ceres.

**Comparative values of green manures and nitrate of soda as measured by the growth of small grains,** A. W. Blair and A. L. Prince (*New Jersey Stas. Bul. 677 (1940), pp. 8*).—Use of soybeans as a green manure and of sodium nitrate as a top dressing on wheat and rye grown continuously on poor Sassafras loam in experiments, 1909–38, were very effective in increasing acre yields of grain and straw. The sodium nitrate top dressings, either at the rate of 160 or 300 lb. per acre, were the more effective. Indications from chemical examination were that the green manure was maintaining the nitrogen content of the soil. Sodium nitrate top dressings did not increase significantly the nitrogen content of the topsoil or subsoil, but the pH of the soil was raised consistently as a result of its use.

**Restoring Colorado's range and abandoned croplands,** E. W. Nelson and W. O. Shepherd (*Colorado Sta. Bul. 459 (1940), pp. 31, figs. 6*).—Ways to restore Great Plains range pastures, abandoned croplands, and depleted mountain ranges are described, with particular attention to seedbed preparation and seeding practices; recommended species, with characteristics, adaptations, and cultural needs, including blue grama, slender, western, and crested wheatgrasses, smooth brome, and sweetclovers; and seeding mixtures for unirrigated pastures for high mountains, lower mountainous and foothill plains, and for plains of eastern Colorado. Features of recommended practices have been noted earlier (E. S. R., 81, p. 39).

**Processing seed of grasses and other plants to remove awns and appendages,** J. L. Schwendiman, R. F. Sackman, and A. L. Hafenrichter. (Coop. Wash. Expt. Sta.). (*U. S. Dept. Agr. Cir. 558 (1940), pp. 16, figs. 7*).—Bluebunch wheatgrass (*Agropyron spicatum*), blue wild-rye (*Elymus glaucus*), Canada wild-rye (*E. canadensis*), Siberian wild-rye (*E. sibiricus*), tall oatgrass (*Arrhenatherum elatius*), bulbous barley (*Hordeum bulbosum*), squirreltail (*Sitanion hystrix*), alfileria (*Erodium cicutarium*), and virgins-bower (*Clematis ligusticifolia*), species adapted to the Pacific Northwest, were processed by milling threshed seed in a hammer mill (E. S. R., 82, p. 181) and cleaning it with a seed cleaner.

The successful deawning of the seed was found to depend on optimum speed of cylinder, a screen with diameter of perforations slightly greater than the seed length, and the full rate of feeding at the determined speed, e. g., the optimum speed ranged from 590 to 1,120 r. p. m. for seeds processed with a 26-in. diameter swinging-hammer type of mill. For medium-sized mills the periphery speed of the cylinder in feet per minute determines the effectiveness of the operation. For machines of different diameters the speed of the cylinder varies inversely about 40 r. p. m. for each inch of increase in diameter.

For the seed of the grasses processed a table shows percentages of seeds deawned and injured, of loss in weight, and of purity and germination, pure live seed, number of seeds per pound, test weight per bushel, and cost of processing per 100 lb. Injured seed was less than 3 percent, although that of bulbous barley was 15 percent and squirreltail 20 percent. Cylinder speeds greater than the determined optima or feeding at half capacity increased the percentage of injured seed. The volume of processed grass seed as shown by test weight per bushel was between about one-half and one-eighth that of untreated samples. Loss in weight was largely offset by increases in the percentage of live pure seed or number of seed per pound. Direct costs ranged between 67 ct. and $1.50 per 100 lb. of original seed, and included milling, cleaning, and 30 percent for supervision and normal overhead.

**Partial self-incompatibility and the collapse of fertile ovules as factors affecting seed formation in alfalfa,** D. C. Cooper and R. A. Brink. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 7, pp. 453–472, figs. 6*).—Following self-pollination in the greenhouse, an average of 14.6 percent of the ovules of alfalfa became fertile as compared with 66.2 percent after cross-pollination on the same plants. Individuals were found to vary significantly in the proportion of ovules that become fertile after selfing, whereas the variability is less after cross-pollination. A rather uniform gradient of fertility occurs from the apex of the ovary downward after self-pollination, the basal ovules seldom containing fertilized eggs. A parallel gradient in fertility is found after cross-pollination, although the proportion of ovules becoming fertile in each position is much higher than after selfing. Pollen tube growth is more rapid in the cross matings. Low fertility following self-pollination is attributed to slow pollen tube growth, failure of the pollen tubes to effect fertilization, and collapse of fertilized ovules. About one-third of the fertile ovules in the selfed series were found to collapse between 72 and 144 hr. after self-pollination as against 7.1 percent in the crossed series. Partial incompatibility associated with self-pollination and high incidence of abortion of ovules containing inbred embryos during the first 6 days after pollination appears adequate to account for most of the difference in seed production following selfing and crossing. See also earlier notes (E. S. R., 77, p. 618; 80, p. 613).

**Pinto bean improvement,** G. N. Stroman, J. Carter, Jr., and J. C. Overpeck (*New Mexico Sta. Bul. 270 (1940), pp. 18, figs. 7*).—The pinto, the most widely grown field bean in New Mexico, is brown and white mottled and has a distinctive flavor not found in other field beans. The color markings of commercial beans are variable and affect the market price; often as many as from 20 to 25 percent are off-color. In bean improvement research begun in 1934 with strains from several localities in New Mexico and from Colorado, selections were made for plant type, early maturity, and uniformity of pod setting and color markings. Strains Nos. 291, 295, and 308 have shown superiority in the irrigated sections, and No. 247, an early-maturing strain, in the dry farming sections. Seed has been distributed to farmers through the New Mexico Crop Improvement Association.

**A survey of variability in white clover (Trifolium repens L.) and its relation to pasture improvement,** G. H. Ahlgren and H. B. Sprague (*New Jersey Stas. Bul. 676 (1940), pp. 42, figs. 4*).—Examination of nursery-grown commercial and native strains of white clover revealed a high degree of variability in all morphological and physiological characters studied. The variations appeared due primarily to heredity. The Ladino strain, and Kent to a lesser degree, represented distinct morphological types. The other strains were not different essentially in form but showed variations ranging from the giant or Ladino type to the dwarf type. The mean values for characters studied

showed that the commercial strains, including Ladino and Kent, had the greatest range in type. Native strains were more intermediate, indicating that natural selection had not produced distinct morphological types in New Jersey. A rapid-spreading ability was associated with an increased size of all plant organs. That rapid-spreading plants usually do not form a dense mat or growth was evidenced by the reduced number of leaves per unit area on such plants. A high percentage of plants deficient in the small white marking (watermark) on the leaflets was found. Giant types similar to Ladino appeared occasionally in nearly all the commercial and native strains. Average coefficients of variability for spread of plant, height of petiole, leafiness, and number of stolons signified as much variation in native as in commercial strains.

One native and five commercial white clover strains were grown in a permanent pasture grass mixture of timothy, redtop, and Kentucky bluegrass, and the strains were studied by dividing the plats into two series and cutting one series regularly at 2-week intervals, simulating close grazing, and the other when the forage was from 4 to 6 in. high. The dwarf type of white clover, Kent, increased in abundance and in comparative yield performance when subjected to close clipping for 2 yr., but decreased in abundance and gave a reduced yield when the sod was not cut until from 4 to 6 in. high. Ladino decreased in percentage abundance when cut every 2 weeks, but maintained itself under the tall cutting treatment. It yielded somewhat more with deferred cutting. The Louisiana strain performed well under both high and low cutting treatments, but was somewhat superior in abundance and in yield under deferred cutting. An 8-percent increase in dry matter was obtained from plats cut at from 4- to 6-in. heights compared to those cut every 2 weeks. High yield performance was associated with percentage of white clover in the vegetation when mineral fertilization was practiced.

In a greenhouse study on differential utilization of lime, phosphate, and potash made by growing six commercial strains of white clover on a soil originally low in these minerals, four soil amendments, consisting of LPK, PK, LK, and LP, were made. With all strains the LPK series was significantly superior, as measured by yield of top growth, Clover strains on the LP and LK treatments were significantly superior to the PK and no-treatment series (which approached each other) in many yield values as measured by top and root growth. Indications were that lime and pH values may be comparatively more important in white clover cultures on poor soils than is phosphate and potash fertilization. The Wisconsin strain was superior to all other strains, except Polish, in root yield when subjected to an LPK treatment. The Ladino and Louisiana strains surpassed the Wisconsin and Oregon strains in yields of tops when grown under an LPK treatment, and the Louisiana strain was superior in yield of tops to the Wisconsin strain on a phosphate-deficient soil. The Wisconsin strain produced greater root growth than top growth under all fertilization treatments. All other strains, when subjected to the LPK treatment, produced greater top growth than root growth. Deficiency of lime, phosphate, or potash tended to eliminate differences between strains in root and top growth of young white clover plants.

**Time and temperature relations of germinating flax**, O. VERHOFF. (N. C. Expt. Sta.). (*Amer. Jour. Bot., 27 (1940), No. 4, pp. 225–231, figs. 6*).—Seed of the Bison and Albidum (an Indian variety) oil flaxes grown under similar conditions were incubated at maintained temperatures of 8°, 13.5°, 17.5°, 22°, 26°, 31°, 34.5°, 38.5°, and 43° C. The two lots were similar in that 31° was most favorable for early production of seedlings, onset of which was greatly delayed by low incubation temperatures. Optima for early completion of

seedling production were 26°, 31°, and 34.5°. Almost complete germination occurred in samples of each lot incubated at 8°. Albidum gave equally high germination percentages at progressively higher temperatures up to 34.5°. Bison was evidently the more sensitive to heat injury, its germination being more and more incomplete at successively higher temperatures. Germination of both lots was markedly reduced at 38.5° and none occurred at 43°. Both lots of seeds began seedling production after the same incubation periods at 38.5°. At each lower temperature seedlings appeared earlier in Bison. At 8° both lots completed seedling production about the same time. At all higher temperatures Bison continued to produce seedlings after germination had ceased in Albidum. Seeds of Albidum showed greater physiological uniformity.

**Poor germination of mechanically dehulled oats,** N. I. Hancock (*Tennessee Sta. Cir. 67 (1940), pp. 4, figs. 2*).—Field and laboratory germinations showed that the viability of oats may be impaired greatly by mechanical dehulling, the loss of germination being largely due to injury at the junction of glume, kernel, and peduncle. Since varieties differ in the way the kernel is enclosed in the glume, this is a factor in the amount of injury caused by dehulling. Threshers, or combines should be so adjusted that the percentage of dehulled oats will be kept at a minimum. Hand-dehulling reduced germination to a lesser extent than mechanical dehulling. Cutting off the brush end of the kernel did not cause a reduction in germination in the laboratory.

**Factors affecting the germination of sugar cane,** H. F. Clements (Hawaii Expt. Sta.). (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 44 (1940), No. 2, pp. 117–146, figs. 27*).—Results of experiments dealing with factors affecting germination of sugarcane, i. e., those external to the seed piece, including soil temperature, aeration, and moisture, and internal, including age and composition, length of seed piece, position of the buds relative to one another, and presence of trash, are presented.

Some practical suggestions derived from the studies include determination of soil temperatures before planting and adjusting practices to unfavorable conditions, e. g., shallow planting of previously treated top seed pieces, careful planting on heavy soils tending to puddle, and choice of top seed pieces. Body material, where it must be used, should be segregated from top material and planted very heavily. Increase in length of seed piece is accompanied by lower germination percentage and lower average shoot vigor. To use pieces with more than three buds is to waste the extra buds, and planting seed pieces with buds in any position wastes nearly all of the buds in the "down" position. The presence of trash on the seed piece slows up emergence and also reduces germination and may conceal plant material without buds. As to composition of planting material, it is desirable that cane for planting be grown for that purpose. Of several treatments available for treating seed pieces before planting, particularly in unfavorable conditions, mere soaking in warm water (85°–95° F.) for 24 or 48 hr. gives improved germination and vigor, but soaking in a warm 1-percent solution of calcium nitrate assures an improved stand and vigor. The "hot-water dip" (20 min. at 52° C.) results in stimulation but appears somewhat less effective than the latter treatment.

**Forms of nitrogen for sugar cane,** R. J. Borden (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 44 (1940), No. 2, pp. 81–88*).—Controlled studies in which three forms of nitrogen, as originally supplied in ammonium sulfate, sodium nitrate, and urea, were compared for their effects upon several characteristics commonly measured in experiments with sugarcane pointed out certain interacting factors which may influence direct effects of the nitrogen fertilizer. Although superphosphate used with the nitrogen carriers did not significantly influence their comparative effects upon cane yield or total dry weight, it seemed

to modify their effects upon cane quality and sugar. The phosphate had little effect upon the comparative percentages of nitrogen and phosphate in the crusher juice of cane fertilized with these different forms of nitrogen, yet it modified their relative effects upon the potash composition. The respective effectiveness of the three sources upon the cane quality was not influenced by the soil, which did, however, alter their comparative efficiencies as producers of cane and of sugar. Both the phosphate and potash juice comparisons from the three nitrogen sources were altered by soil differences, although the interaction of different soils with different nitrogen forms had no significant influence on the percentage of nitrogen in the crusher juice.

**Relation of the depth to which the soil is wet at seeding time to the yield of spring wheat on the Great Plains,** J. S. Cole and O. R. Mathews. (Coop. Mont., N. Dak., Wyo., Nebr., and Colo. Expt. Stas.). (*U. S. Dept. Agr. Cir. 563 (1940), pp. 20, figs. 2*).—Soil moisture data at or near planting time on the methods of preparation for spring wheat, obtained, 1907–38, at 15 stations in the Great Plains for a total of 261 station years, were used to place each plat or method each year in 1 of 3 groups—soil wet 1 ft. deep or less, wet 2 ft. deep, and wet 3 ft. deep or more. Yields were assembled according to this placement. On plats continuously cropped and spring plowed, the average yield from soil wet to the different depths at seeding time were 1 ft., 6.3 bu.; 2 ft., 11.7 bu.; and 3 ft., 15.5 bu. On the plat continuously cropped and fall plowed, yields from similar conditions were 6.7, 11.7, and 15.9 bu., respectively, and on plats alternately cropped and fallowed, the corresponding yields were 6.9, 12.6, and 19.9 bu. Under the limited precipitation of the Great Plains, the initial water content of the soil, which can be approximated by the depth to which the soil is wet, has been a strong determinant of the yield that will be produced.

Frequent failures, low average yields, and seldom good yields from spring wheat sown on soil wet to only 1 ft. deep or less show that planting is not warranted when that condition exists in the area. Two ft. of wet soil may be safe in some localities but not in others. The best assurance of good yields is afforded by an initial condition of 3 ft. or more of wet soil, a condition found much oftener on fallowed land than on land cropped the previous year.

**Varieties of winter wheat in Nebraska,** K. S. Quisenberry, O. J. Webster, and T. A. Kiesselbach. (Coop. U. S. D. A.). (*Nebraska Sta. Bul. 326 (1940), pp. 28, figs. 5*).—Yields, other agronomic characters, milling and baking qualities, winter hardiness, and smut resistance are reported from comparative studies of winter wheat varieties, 1930–39, supplementing earlier work (E. S. R., 70, p. 42); wheat improvement at the station is reviewed briefly; and important varieties are described. Although spring wheat constituted over 80 percent of the total wheat acreage in Nebraska before 1900, its proportion has decreased until at present more than 90 percent of the State acreage is in winter wheat. The change was primarily due to introduction of Turkey wheat and to development of other adapted hard red winter wheats, as Nebraska No. 60, Cheyenne, and Nebred.

At Lincoln, 1930–39, Cheyenne made the highest average yield and was followed by Kawvale, Tenmarq, Turkey (S. Dak. No. 144), and Nebred. At North Platte, 1933–36 and 1938–39, Cheyenne, Nebraska No. 60, and a local Turkey returned highest yields, with Tenmarq and Nebred closely approaching. At Alliance, Cheyenne and Nebraska No. 60 have given good yields. Varieties recommended for Nebraska are Nebred, Cheyenne, and Turkey. Nebred, a station selection from Turkey (S. Dak. 144) released in 1938, is resistant to forms of bunt now known to be present in Nebraska, has given good average yields, is more winter hardy than ordinary Turkey, and has acceptable milling and baking qualities. Cheyenne, selected from Crimean and distributed in 1933, is characterized by high yield, stiff straw, erect head, and tolerance to hessian fly, but is susceptible

to bunt and to both leaf and stem rust. Turkey, grown most widely in the State, usually compares fairly well with other varieties, giving a fair yield. It has average winter hardiness, is medium in time of maturity, and the grain quality is more or less standard with the trade.

**The Federal Seed Act and its relation to Montana farmers and dealers: Form of label prescribed for Montana,** W. O. Whitcomb (*Montana Sta. Cir. 156 (1940), pp. 15*).—Features of the Federal Seed Act approved August 9, 1939, are summarized, with comments on records and labels for agricultural seeds under the act, exemptions, a comparison of the act with the Montana Seed law, and remarks on how the Federal Act may benefit Montana shippers and dealers.

**Just weeds,** E. R. Spencer (*New York: Charles Scribner's Sons, 1940, pp. XVI+317, figs. 102*).—The popular presentation of the characteristics of the principal weed plants of the United States is supplemented by technical descriptions and appropriate illustrations. The book is featured by habitat indexes in which grasslike and nongrasslike weeds are grouped according to kind of crop, situation, and season.

**Organic reserves in the roots of bindweed,** C. G. Barr. (Colo. Expt. Sta. and U. S. D. A.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 6, pp. 391–413, figs. 10*).—Effects of different cultural practices and chemical treatments on the trend of organic reserves in roots of *Convolvulus arvensis* were studied, 1936–38.

The maximum reducing-sugar content did not exceed about 2 percent of the fresh weight of the roots of undisturbed plants. Total sugars reached a maximum of about 7 percent in late October, with a minimum value in May. The percentage of starch increased gradually, reaching a maximum in August or September, followed by a sharp decline coincident with a rapid increase in percentage of total sugar. This behavior suggested the shift of polysaccharides to soluble carbohydrates which commonly occurs in plants during the cold season. Cultivating the plants at 2-week intervals held the total sugar and starch content to about 1 percent each. In roots of cultivated plants the readily available carbohydrate accumulation was reduced to 2.3 percent, about one-sixth of that of undisturbed plants. One cultivation early in May 1937 reduced the sugar and starch contents to about 2 percent each, while cultivation in late July reduced the starch content almost 50 percent without an important effect on total sugars. Similar tests in 1938 showed comparable results, indicating the advantage of early fallowing.

Colloidal nitrogen in the roots of undisturbed plants increased gradually from May until the last of October. Cultivation checked this accumulation. The total soluble, amino, amide, nitrate, and nitrite nitrogen fractions showed no consistent variations. Results obtained for total nitrogen and nitrogen fraction determinations suggested that the importance of nitrogen in a study of root reserves in bindweed is open to question.

The carbohydrate content was held to a lower value by cultivation than by application of sodium chlorate. The combined treatment of sodium chlorate following early-season cultivation did not increase the effectiveness of chlorate in reducing the carbohydrate reserve. Sodium chlorate applied in fall to uncultivated plants was relatively more effective than that in early applications in reducing the root reserves and in controlling the weed. Plants cultivated systematically all season at emergence and 3, 6, 9, 12, or 15 days after emergence were uniformly low in starch content, from 1 to 2 percent, as determined by takadiastase digestion. Cultivating at emergence evidently had no greater effect than the less frequent cultivations in reducing the carbohydrate content of bindweed roots in the top foot of soil.

**Russian knapweed and perennial peppergrass,** E. A. Helgeson (*North Dakota Sta. Bul. 292 (1940), pp. 26, figs. 9*).—Russian knapweed and perennial peppergrass and their distribution and characteristics are described, together

with reports on experiments designed for their control. Promising control measures for the two weeds and precautions in the use of chlorates are outlined.

*Russian knapweed.*—In studies of the root system of Russian knapweed (*Centaurea repens*) begun in 1936 on an old infestation in southeastern North Dakota, vertical roots were lost at a depth of 6 ft. but evidently penetrated much deeper. while horizontal roots usually were in the upper 8 in. of soil. Dormant buds or vegetative shoots were not found on roots much below the 8-in. level. The extent of the root system suggested that this plant could store large quantities of reserves. Excellent control was obtained with sodium chlorate and Atlacide applied in solution or dry at rates varying from 2 to 6 lb. per treatment per square rod usually in one spring and one fall treatment. No appreciable difference was noted between chemicals or methods of application. With chlorate at 8 ct. per pound, control would cost from 40 to 60 ct. per square rod for chemicals alone.

*Perennial peppergrass.*—Tests of the effectiveness of chlorates in the control of perennial peppergrass (*Lepidium draba*) were begun in 1937 near Leonard, N. Dak. Numerous horizontal roots mostly in the upper regions of the soil level were found to produce deeply penetrating vertical branches. Excavation 6 ft. deep in Fargo clay found these vertical roots still about ⅛ in. in diameter, tapering very little, and evidently penetrating much deeper. Buds apparently were not present on these vertical roots. The root system as a whole seemed enormous in comparison with the aerial portion. Sodium chlorate was applied in spring and fall in solution and dry and Atlacide in solution at rates of 2, 3, 4, and 5 lb. per square rod per treatment, and some plats were mowed before treatment and others left undisturbed. Spraying unmowed plats seemed to give the best control with both chemicals. Applications totaling from 8 to 10 lb. were usually needed for satisfactory control, although in some cases the 6-lb. liquid applications sufficed. The Atlacide in solution about equaled sodium chlorate in toxicity in some cases. Dry sodium chlorate gave excellent control with 10 lb. and fair control with 8 lb. per square rod. Control of the weed with chlorates at 8 ct. per pound cost from 60 to 80 ct. per square rod for chemicals alone. Under the experimental conditions this weed was very resistant to chlorates.

## HORTICULTURE

**[Horticultural studies by the Florida Station]**, G. H. Blackmon, R. D. Dickey, R. J. Wilmot, F. S. Jamison, V. F. Nettles, A. L. Stahl, J. C. Cain, J. V. Watkins, D. G. A. Kelbert, A. N. Brooks, J. H. Jefferies, A. F. Camp, W. Reuther, G. R. Townsend, J. R. Beckenbach, J. R. Neller, W. T. Forsee, Jr., S. J. Lynch, and W. M. Fifield. (Partly coop. U. S. D. A. et al.). (*Florida Sta. Rpt. 1939, pp. 102–113, 114–116, 132, 141, 142, 143, 144, 147, 148, 152, 153, 154, 170, 171, 181–184, 185–187, 188, 189, figs. 6*).—Included are progress reports on the following investigations: Fertilizer and cover crop tests with pecans; varieties of pecans and other nuts; propagation, planting, and fertilizer trials with tung-oil trees; varietal and propagation trials with shrubs and ornamentals; fertilizer studies with truck crops; relation of N absorption to food storage, growth, and reproduction in the pecan; varieties of blackberries, grapes, peaches, and other fruits; preservation of citrus juices and pulps; cold storage in citrus; physiology of maturity processes in citrus; relation of soil reaction to growth and yield of vegetable crops; development of varieties and strains of vegetables adapted to commercial use; effects of green-manure crops on growth, yield, and quality of vegetables; effect of mineral deficiencies on the adaptability of certain vegetable varieties; value of certain root-inducing substances in rooting cuttings of various plants; methods of fertilizer placement for

vegetables; testing of tomato varieties; and the response of strawberries to $MgSO_4$.

From the Citrus Substation are reported studies on variety testing and breeding of citrus, rootstocks for citrus, nutritional needs of citrus, and the effect of Zn and other unusual mineral supplements on the growth of horticultural plants.

From the Everglades Substation are reported studies on fruit and forest trees, soil fertility investigations with truck crops and citrus, growth of celery at different fertility levels, and variety tests of vegetables.

Reports from the Subtropical Substation dealt with the culture of citrus and avocados, reforestation, improvement of tomatoes through selection of new hybrids, minor fruits and vegetables, pollination of mangoes, varieties of papayas and of miscellaneous fruits and ornamentals, pruning and staking of tomatoes, maturation of the tomato, and variety tests of vegetables.

**[Horticultural studies by the Georgia Coastal Plain Station, 1938]** (*Georgia Coastal Plain Sta. Bul. 30 (1939), pp. 82–88, 90–111, 131–133, fig. 1*).—Information is offered on the progress of cultural, varietal, and fertilizer studies with the tomato, watermelon, lima bean, and cabbage; on the breeding of watermelons resistant to wilt and snap beans resistant to root and leaf diseases and nematodes; the fertilizer needs of asparagus; variety trials with sweet corn and other vegetables; and varieties of peaches, pecans, pears, grapes, strawberries, figs, jujubes, blueberries, citrus fruits, tung oil, and other crops

**[Horticultural investigations by the Puerto Rico College Station]**, A. Roque, J. Adsuar, F. Julía, J. Guiscafrè Arrillaga, L. A. Gómez, J. Simons, A. Riollano, L. A. Serrano, N. A. Schappelle, J. A. B. Nolla, F. Méndez, and E. Molinary Salés (*Puerto Rico Col. Sta. Rpt. 1939, pp. 61–64, 69–73, 78–92, 98, figs. 5*).—Information is presented on the progress of the following studies: Breeding of cucumbers for resistance to downy mildew; breeding peppers for resistance to mosaic disease; selection of papaya with relation to sex; breeding of the papaya; an analysis of production practices on coffee plantations; fertilizer needs and light requirements of the coffee plant; comparison of the Columnaris and Puerto Rican varieties of coffee; the need of coffee for lime; root studies of the coffee plant; studies of fruit crops, including the avocado, citrus fruits, grapes, guavas, mangos, papaya, and pineapple; and investigations on asparagus, beans, cantaloups, cucumbers, eggplant, lettuce, onions, peas, plantain, squash, and tung-oil tree.

**Vegetative propagation of tropical and sub-tropical plantation crops**, G. St. Clair Feilden and R. J. Garner (*Imp. Bur. Hort. and Plant Crops [East Malling, Kent], Tech. Commun. 13 (1940), pp. 99, figs. 22*).—Discussing different methods of vegetative propagation, the authors present specific information on the propagation of a large number of plants, with literature references.

**[Vegetable studies by the New Jersey Stations]** (*New Jersey Stas. Rpt. 1939, pp. 65–75, 126–128*).—Included are progress reports on the following: The effect of lime, fertilizer, and organic matter on the yield of Rutgers tomatoes; the effect of fertilizing the preceding cover crop on the yield of the Rutgers tomato; relation of K to vegetable crop yields; the phosphoric acid requirements of the tomato; the relation of liming material to overliming injury to celery; methods of fertilizer placement for tomatoes; mulching materials for the tomato; effect of root temperatures on the development of nutrient deficiences in asparagus; a survey of tomato fields in Cumberland County; production of lima bean seed on nutrient-deficient plants; relation of irrigation water to celery growth on a Collington sandy loam; tomato and asparagus breeding; and spray residue investigations with apples and tomatoes.

**Manure experiments with vegetable crops in Arkansas,** J. R. Cooper and V. M. Watts (*Arkansas Sta. Bul. 392* (*1940*), *pp. 40*).—Used alone or in combination with complete fertilizers, barnyard manure increased returns from vegetable crops growing on Clarksville silt and Ruston fine sandy loams, particularly on the latter. A large part of the increases in yield from manure treatments plus commercial fertilizer are attributed to improvement in physical condition of the soil, notably in improved water-absorbing and water-holding capacity. The addition of P to manure increased crop yields on Clarksville silt loam, but not to the extent of appreciably increasing net returns. Different vegetables responded differently in any given year, and there was considerable annual variation in the response of any one kind. On Clarksville loam, strawberries, sweetpotatoes, tomatoes, and peppers failed to respond profitably to the use of manure, in addition to fertilizer, even when only the cost of handling manure produced on the farm was considered. Asparagus, spinach, and cabbage showed a profit with the cost of manure as high as $1 per ton. On Ruston loam, no crop failed to pay the cost of handling manure produced on the farm, and such crops as potatoes, green-wrap tomatoes, watermelons, cucumbers, spinach, and cantaloups returned a profit with manure at $1 per ton. The best time to apply manure was in December or early January. Working the manure into the soil as soon as practicable facilitated decomposition. For cantaloups, manure was used most efficiently when placed in a broad, deep furrow, covered with 3–4 in. of soil, and allowed to settle for about 6 weeks before the seed was planted.

**Effect of spacing on asparagus production in California,** H. A. Jones and G. C. Hanna. (U. S. D. A. and Calif. Expt. Sta.) (*Canner, 90* (*1940*), *Nos. 15, pp. 14, 15; 16, pp. 17–19, fig. 1*).—Based on investigations at Davis and Ryer Island, Calif., in which the rows were 7.5 ft. apart and the plants spaced 12, 18, 24, 30, and 36 in. in the row, the authors conclude that close spacing is preferable. Under the conditions of the study, crowns placed 12 and 18 in. apart produced significantly higher yields than those spaced farther apart. In California, planting is usually done during the rainy season, when the soil is in poor physical condition, with the result that many plants fail to survive. With close spacing, these skips are less serious than with wide spacing. Regardless of spacing, the average size of the spears was essentially the same, and the plants reached a peak as to size of spear and began to decline at about the same time.

**Tenderometer readings as an index of quality of fresh asparagus.—A preliminary paper,** R. R. Jenkins and F. A. Lee. (N. Y. State Expt. Sta.). (*Food Res., 5* (*1940*), *No. 2, pp. 161–166, fig. 1*).—Observations on fresh samples of Mary Washington asparagus taken at three periods during the cutting season from three types of soil showed that for a given variety grown under known conditions the tenderometer gave a high correlation for tenderness and quality, as compared with crude-fiber-content and taste tests. Although no definite limits of tenderometer readings are yet possible for different commercial grades of asparagus, the authors suggest that, as a tentative maturity standard, a tenderometer reading of 150 or lower indicates fancy quality. It was apparently not essential to separate asparagus into the various commercial sizes.

**Yellows-resistant varieties of cabbage suitable for New York State,** O. A. Reinking and W. O. Gloyer (*New York State Sta. Bul. 689* (*1940*), *pp. 28, figs. 4*).—Discussing the nature of the cabbage yellows organism and its widespread distribution, the authors present the results of trials of numerous yellows-resistant cabbage varieties. The following midseason varieties are recommended for yellows-infested fields: Racine Market, Early Copenhagen

Resistant, Marion Market, Glory Yellows Resistant, Globe, All Head Select, and Wisconsin All Season. Of early varieties, Jersey Queen was found highly resistant but not heavy in yield. Detroit Resistant and Resistant Golden Acre yielded well but needed further selection for resistance. No late kind was found which met the needs of growers. The late varieties lacked in quality, were unproductive, or were not sufficiently resistant to the disease. Wisconsin Ballhead was almost completely resistant but did not yield sufficiently or store well.

As to cultural practices, it is recommended that great care be taken not to introduce the disease into clean soil since it survives a long time even if no cabbage is grown. On clean soil, as a general rule, the resistant varieties did not yield as well as susceptible kinds.

**Descriptions of types of principal American varieties of orange-fleshed carrots,** R. MAGRUDER, V. R. BOSWELL, S. L. EMSWELLER, J. C. MILLER, A. E. HUTCHINS, J. F. WOOD, M. M. PARKER, and H. H. ZIMMERLEY. (Coop. Cornell Univ. and Calif., La., Minn., Tex., and Va. Truck Expt. Stas.). (*U. S. Dept. Agr., Misc. Pub. 361 (1940), pp. 48, pls. 22, fig. 1*).—The fifth of a series (E. S. R., 80, p. 624) dealing with descriptions of types of the principal varieties of vegetables, this paper discusses the leading varieties of the cultivated carrot. Information is given on the relative importance of varieties for specific uses and geographical regions, based on the resistance of certain varieties to disease and insects and responses to different environmental factors.

**The nutrition of lettuces grown as sand cultures under glass,** R. M. WOODMAN (*Ann. Appl. Biol., 27 (1940), No. 1, pp. 5–16*).—Grown in jars of sand supplied with cultural solutions of known concentrations, May King lettuce was found "to respond well to N and P, both as regards yield and earliness of maturity, but to make practically no response to K over a wide range of concentrations. Cheshunt Early Giant lettuce behaved similarly, but no development of purple flushes or tints took place with this nontinted lettuce when there was a deficiency of P or N. A deficiency of N, however, resulted in a light-green lettuce of a characteristic and abnormally regular and smooth appearance. Lack of Ca . . . did not cause deficiency symptoms other than that of decreased yield. A deficiency symptom noted with Mg was a tendency to an etiolated plant and to a bleached whitish-pink appearance of the older leaves."

**Determining the grade of peas from the raw product,** E. P. WALLS, W. B. KEMP, and H. L. STIER. [Md. Expt. Sta.]. (*Canner, 90 (1940), No. 15, pp. 28, 30*).—Continuing the project (E. S. R., 81, p. 515), the authors made tenderometer readings in 1939 on 632 samples of peas graded previously by expert technologists and again reported a high degree of correlation between tenderometer readings and the results of standard methods of grading. The tenderometer readings agreed more closely with the actual grades than did those obtained with a texturemeter.

**A chlorophyll deficient pimiento,** H. L. COCHRAN. (Ga. Expt. Sta.) (*Jour. Hered., 30 (1939), No. 3, pp. 81–83, figs. 2*).—A description is presented of a chlorophyll-deficient pimiento plant in which leaves, buds, flowers, and fruit were involved. The patterns of the chlorophyll-deficient areas were not constant as to shape or time of expression. Due to the premature abscission of fruits, it was not possible to secure viable seed with which to grow a subsequent generation.

**New Illinois sweet-corn hybrids: Country Gentleman and Narrow Grain Evergreen varieties,** W. A. HUELSEN (*Illinois Sta. Cir. 504 (1940), pp. 20, figs. 8*).—Discussing the status of sweet corn breeding at the station and the methods followed in distributing breeding material, the author describes the

performance of certain Country Gentleman and Narrow Grain Evergreen crosses, their regional adaptation, and principal characteristics.

**[Pomological studies by the New Jersey Stations]** (*New Jersey Stas. Rpt. 1939, pp. 31, 32, 34, 35, 36, 54–64, 65*).—Among investigations noted are the effect of weeding and sanding on rebuilt cranberry bogs; use of chemicals for killing weeds in cranberry bogs; methods of harvesting cranberries; fertilizers for the cranberry and blueberry; mulching v. cultivation for the blueberry; pruning and spacing of blueberries; climatic factors in fruit production; peach breeding and distribution; growth of peach trees from embryos grown in sterile media; catechol tannin content of different peach varieties; apple breeding; relation of growth status to potential production of the apple; pruning of the apple; blooming data on the Elberta peach; nutrient-deficiency symptoms in the peach; root development of 3-year-old apple trees on Coastal Plain soil; strawberry breeding for general improvement, resistance to red stele, and everbearing characteristics; growth standards for strawberry varieties; blackberry and dewberry breeding; soil management for raspberries; and varieties of blueberries and other small fruits.

**The internal temperatures of fruit tree buds.—III, Trials with humidified heat for the control of frost damage,** J. Grainger (*Ann. Appl. Biol., 27 (1940), No. 1, pp. 1–4, figs. 4*).—In continuation of this series (E. S. R., 82, p. 483), "an account is given of the distributions of heat and relative humidity from three methods of orchard heating, together with the results of experiments with a simple type of humidified heating. Ignited balls of papier mâché, which had been soaked in crude oil, were humidified with saturated garden refuse, such as long grass or lawn clippings. This arrangement heats the air, and at the same time either maintains or enhances the relative humidity. No lowering of the internal temperature of the bud is produced, and the method helps to control a frost at its source by diminishing radiation of heat from the earth to an open sky. Frosts may therefore be controlled in practice by the expenditure of about one-third the fuel used in the flame-type heaters. Lateral distribution of heat from orchard heaters is not great. Suggestions are made for the alternate disposition of fruit trees and heaters upon a slope. Advantage may thereby be taken of the katabatic wind, which occurs during a radiation frost, to direct the heated air toward the trees."

**Small fruit and vegetable trials in toxic orchard soils,** C. L. Vincent. (Wash. Expt. Sta.). (*Wash. State Hort. Assoc. Proc., 35 (1939), pp. 82–85*).—Of a considerable number of crops planted in 1939 on soil which for many years had been in orchards prior to the initiation of the experiment, certain species, notably rye, potatoes, asparagus, and tomatoes, were shown to be more resistant than others to arsenical residues in the soil, the result of many years of intensive tree spraying. The thinnest stand of rye was on the soil containing the most arsenic. Lima beans appeared particularly subject to seed injury, apparently due to arsenic in the soil. The more years elapsing between removal of trees and planting to horticultural crops, the better were the results.

**Total yields of apples in bushels upon young trees,** M. A. Blake (*N. J. State Hort. Soc. News, 21 (1940), No. 5, p. 1247*).—Stayman, Rome, and Delicious trees, producing their first crop in their fifth summer, yielded ⅘ bu., 1⅛ bu., and a scattering of fruits, respectively. At the close of 9 yr. the average yield of all fruit for five seasons was 1⅔, 2, and 1 bu., respectively. In the tenth year the average yields were 6¾, 8⅛, and 5⅛ bu., respectively.

**The optimum life of an apple orchard,** C. W. Ellenwood. (Ohio Expt. Sta.). (*Ohio State Hort. Soc. Proc., 73 (1940), pp. 95–101*).—Based on an analysis of returned questionnaires from growers and records taken in the

station orchard, the conclusion is given that apple trees beyond 35 yr. of age should be carefully watched as to declining yields and returns. Varieties differed in their attainment of full production, and the environment was also a factor. About three-fourths of the growers were of the opinion that from 15 to 25 yr. was the period of most economical production for apple trees. Plans for maintaining a succession of age classes in the orchard are discussed.

***Preliminary studies on the effect of tar oil spray for the prevention of* fruit set in apples**, C. P. Harley and J. E. Moore. (U. S. D. A. and Wash. Expt. Sta.). (*Wash. State Hort. Assoc. Proc., 35 (1939), pp. 47, 48*).—Studies (spring of 1939) on the use of a spray containing 2 percent of actual tar oil for preventing fruit set of apples indicated the need of thorough coverage if anywhere near 100-percent kill is anticipated. The tar oil caused abscission by injury to the pedicels or stems. The late cluster-bud stage, when the central blossoming was just beginning to open, appeared to be the most effective time for treatment. Varieties reacted differently to treatment, depending on their blooming habits. Considerable injury was done to the primary leaves, and some spur killing, chiefly of the weaker spurs, was noted on all varieties.

**Reduction and delay of fruit abscission by spraying with growth substances**, A. E. Murneek. (Mo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 432–434*).—Using α-naphthaleneacetic acid and α-naphthaleneacetamide sprays in concentrations of 0.0005 and 0.001 percent, the author observed, in both Delicious and Stayman Winesap, material reduction of the preharvest fruit dropping as a result of treatment. In one orchard of Delicious trees sprayed with 0.0005 percent naphthaleneacetic acid, a drop of 24 percent was recorded, as compared with 84.4 percent in the controls. Increasing the concentration from 0.0005 to 0.001 percent still further decreased dropping. There was some indication that the acetamide was more effective than the naphthaleneacetic acid. The author believes that the chemicals have an immediate, conspicuous, and valuable effect in preventing excessive abscission of apples during the preharvest and harvest periods.

**Spur nitrogen and pre-harvest McIntosh drop**, L. Southwick. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 435–437*).—By labeling in late August all the spurs on an 11-year-old McIntosh tree and recording thereon the date of fruit abscission, the author was able to segregate spurs for total N analysis on the basis of date of fruit drop. The general trend of N percentage values indicated an inverse relationship to fruit-holding capacity. Spur size in terms of fresh weight appeared to be associated positively with a tendency for the spur to drop its fruit prematurely. The data support the theory that a high state of soil fertility tends to increase preharvest dropping of the McIntosh apple.

**The pre-harvest drop of mature McIntosh apples as influenced by applications of nitrogen carrying fertilizers**, M. B. Hoffman. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 438–442*).—Observations in an orchard near Red Hook, N. Y., in which McIntosh trees, 16 yr. old in 1935, received 8 lb. of sulfate of ammonia each for 4 successive years showed that N applications increased the abscission of fruit in the preharvest period. In 1935, 1936, and 1937, with rainfall relatively normal or below, the trees receiving N dropped from 15 to 20 percent more of their total crop than controls. In 1938, with excessive rainfall, the N trees dropped 32 percent more fruit than the unfertilized. Over the 4 yr., N had increased total yield and preharvest dropping approximately in the same amounts. In 1939, by decreasing and, in certain trees, omitting the N application, the percentage of preharvest dropping was de-

creased. With no spring application, dropping was about the same on trees fertilized the 4 preceding years as on those never fertilized. Determinations of soil collected in the upper 6 in. revealed no nitrates present on June 1 or September 1 except beneath trees fertilized the current year.

**Observations on effects of soil covers as conservation practices in peach orchards**, J. T. BREGGER and A. M. MUSSER. (U. S. D. A. and S. C. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 1–6*).—Stating that there is accumulating evidence that certain conservation practices, such as continuous vegetative and mulch covers, modified sod, or abbreviated annual cultivation, are practical and successful in peach orchard management, the authors cite examples in which certain of these practices have been used with good results. Plats laid out in 1939 in a commercial orchard near Inman, S. C., permitted the comparison of cultivation with early seeding of annual lespedeza. Soil moisture readings during droughts showed no significant difference in subsoil moisture between the different plats. Growth and fruiting were also apparently comparable.

**Harvesting and handling freestone peaches for canning**, E. L. OVERHOLSER. (Wash. Expt. Sta.). (*Wash. State Hort. Assoc. Proc., 35 (1939), pp. 71–79*).—A number of varieties are discussed with relation to their outstanding characteristics and adaptability for canning, and information is given as to methods of picking and handling fruit designed for canning use. Common storage has little possibility for holding peaches for any considerable length of time. Fruit harvested at the proper stage of maturity may be held at from 32° to 34° F. for several days and still yield a satisfactory canned product.

**Citrus culture in California**, R. E. CARYL (*Calif. Agr. Col. Ext. Cir. 114 (1940), pp. 48, figs. 19*).—The author discusses the history and development of the industry, types and varieties, propagation, establishment of orchards, fertilization and cultural care, irrigation, pruning, frost protection, control of pests, harvesting and handling, and costs of production.

**The oriental persimmon**, H. P. GOULD (*U. S. Dept. Agr. Leaflet 194 (1940), pp. 8*).—This leaflet contains information on the distribution, varieties, pollination requirements, cultural needs, pruning, marketing, and uses.

**Papaya chemistry and flavor**, S. J. LYNCH and W. M. FIFIELD. (Fla. Expt. Sta.). (*Subtrop. Gard., 2 (1940), No. 10, pp. 6, 14*).—Comparing sweet-tasting with flat-tasting papaya fruits, the authors found almost negligible differences in acid, moisture, and ash contents. There was a definitely higher percentage of total sugars in the sweet fruits, due largely to the appreciably higher percentage of hydrolyzable sugars. The ratio of free reducing to hydrolyzable sugars is considered an indication of sweetness. Analyses of fruits from 10 trees of the Betty variety showed about as much variation among fruits on a single tree as among those on different trees. The average of 26 fruits for 10 trees showed 0.039 percent acid, 90.6 percent moisture, 0.46 percent ash, 4.71 percent free reducing sugars, 1.32 percent hydrolyzable sugars, and 6.03 percent total sugars. The range in total sugars was from 4.46 to 7.6 percent. Definitely sweet-tasting papaya fruits had about 8.09 percent total sugars, and the definitely flat-tasting fruits about 5.41 percent.

**Grape growing in California**, H. E. JACOB (*Calif. Agr. Col. Ext. Cir. 116 (1940), pp. 80, figs. 20*).—Information is presented on types of grapes, climatic requirements, viticultural regions of the State, establishment of vineyards, pruning and training, cultural care, fruit thinning, girdling, irrigation, propagation and grafting, harvesting and handling, control of insect and disease pests, and varieties.

**Pruning of the low-bush blueberry**, F. B. CHANDLER and I. C. MASON. (Maine Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 609, 610*).—Stat-

ing that low-bush blueberries, *Vaccinium angustifolium*, are pruned by burning the plants to the soil every 2 or 3 yr., the authors report the results of a study of four treatments all initiated in 1930 and including 2- and 3-yr. burning with hay or oil, and 2- and 3-yr. pruning by clipping the tops at the ground. In the burned plants, new growth issued from underground stems, and in the clipped plants from above-ground stubs. There was no significant difference in yield between the 2- and 3-yr. oil burns, and the 2-yr. burns (hay or oil) showed a decreased yield in the 1937 crop as compared with the 1931 crop. Cutting every 2 yr. produced significantly smaller yields than hay or oil burning practiced every 2 or 3 yr. Two-yr. burning is not recommended as a general practice.

**The inheritance of certain characters in the cultivated blueberry,** G. M. Darrow, J. H. Clark, and E. B. Morrow. (U. S. D. A. and N. J. and N. C. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 611–616*).—Records taken on a large number of seedlings produced from crosses of known parentage showed that certain parents have apparent capacities for transmitting definite characteristics. For example, Stanley proved to be a source of large size, light-blue color, and fair-to-good scars. Russell and Allen varieties transmitted small size, good scars, very dark-blue-to-black color, and early maturity. Grover gave bad scars and very dark-blue-to-black color. Cabot seedlings were generally small and early maturing. Jersey, selections of *Vaccinium virgatum*, and hybrids of *V. virgatum* and *V. corymbosum* transmitted late maturity.

**The effect of growth substances on the rooting of blueberry cuttings,** F. B. Chandler and I. C. Mason. (Univ. Maine). (*Science, 92 (1940), No. 2376, p. 35*).—Extensive experiments conducted with summer cuttings of *Vaccinium corymbosum* and using various forms of growth-promoting substances led to the conclusion that it does not appear advisable to recommend the use of such materials for stimulating the rooting in this high-bush blueberry.

**Growing gooseberries and currants,** H. G. Swartwout (*Missouri Sta. Cir. 208 (1940), pp. 12, figs. 6*).—General notes are presented relating to varieties, planting stocks, propagation, soil adaptation, planting, cultivation, pruning, harvesting, and control of pests.

***Is it possible to devise a satisfactory judging schedule for black walnuts?*** L. H. MacDaniels (*North. Nut Growers Assoc. Proc., 30 (1939), pp. 24–27*).—Cracking tests with a considerable number of black walnut varieties showed, in general, a fair degree of correlation between percentage of meat and suitability of variety for a given environment. Stambaugh, Thomas, Todd, and Creitz, varieties best adapted to western New York, averaged the best scores based on percentage of meats. A test of different samples of Snyder nuts taken from the same tree showed considerable difference in score because of variation in cracking operations. A schedule of points for judging nuts is outlined.

**The shuck-nut ratio in black walnut varieties,** L. H. MacDaniels (*North. Nut Growers Assoc. Proc., 30 (1939), pp. 74–76*).—Observations on samples of nuts collected mostly from young grafted trees and shucked while still firm and green showed great differences in the shuck:nut ratio. In certain samples of Todd, Mintle, and Wiard the nut equaled half the initial weight, while in others with thick, spongy husks the nuts were only from 27 to 30 percent of the total weight. There was a considerable difference in samples of a single variety collected from trees under different conditions. The varietal data are tabulated.

**[Ornamental horticultural studies by the New Jersey Stations]** (*New Jersey Stas. Rpt. 1939, pp. 75–85*).—Progress statements include the following studies: Adaptation of the subirrigation method of supplying nutrients to carnations, roses, and snapdragons; the mineral nutrition of the rose; physical factors

of root media affecting growth of roses; depth of media of various natures and textures in the greenhouse culture of roses; influence of root and air temperatures on growth and metabolism of gardenias; the depth of tile as related to the growing of sweet peas; and miscellaneous culture and variety tests.

**Peony studies,** E. R. Honeywell, F. C. Gaylord, and K. I. Fawcett (*Indiana Sta. Bul. 444 (1940), pp. 47, figs. 22*).—As a result of trials with a number of varieties cut at different stages of bud development and held for 2–4 weeks in cold storage under known temperature conditions it was found that certain varieties are better adapted than others to this method of handling. The following varieties proved most satisfactory: Edulis Superba, Felix Crousse, Festiva Maxima, Floral Treasure, and Monsieur Jules Elie. Several factors, such as variety, soil treatment, weather conditions, time of day at cutting, and methods of handling, were involved in determining the proper stage of maturity at which to cut peonies for storage. In general, the buds of the full, double-flowered varieties need to be more fully expanded and to show more color than do single or partly double varieties. Buds of red varieties need to be more fully expanded than those of white varieties. The rapid, careful handling of peonies during the operations of cutting, grading, and storing was important in their conservation. Dry-packing proved less expensive and more satisfactory than moisture application prior to storage. Peonies responded favorably to applications of commercial fertilizers. Detailed information as to procedure in handling peonies designed for shipment is included.

## FORESTRY

**A guide to forestry activities in North Carolina, South Carolina, and Tennessee,** W. Maughan (*Asheville, N. C.: Miller Ptg. Co., 1939, pp. [6]+287, [pls. 29]*).—General information is presented by the Appalachian Section, Society of American Foresters, with relation to various activities.

**On the tree-area ratio and certain of its applications,** H. H. Chisman and F. X. Schumacher (*Jour. Forestry, 38 (1940), No. 4, pp. 311–317, figs. 2*).—A method is outlined and illustrated for allocating tree area according to diameter at breast height of individual trees by means of a quadratic equation fitted by the method of least squares to sample plot data. Two applications are exemplified—the pine-hardwood type on the Piedmont Plateau and a fully stocked loblolly pine. The investigation in the loblolly pine brought out the fact that there was no perceptible effect of age or site index upon the tree-area ratio.

**Use of the cull caliper in scaling white oak stave bolts,** M. C. Bonney. (U. S. D. A.). (*Jour. Forestry, 38 (1940), No. 4, pp. 351–355, figs. 2*).—Discussing the construction and use of the cull caliper, the author states that it should simplify the task of training inexperienced men to scale white oak and provide the check scaler with a standard which will not become less accurate or consistent from lack of use, such as is the case of the human eye.

**The hammer mill as an important nursery implement,** H. A. Steavenson. (U. S. D. A.). (*Jour. Forestry, 38 (1940), No. 4, pp. 356–361, figs. 3*).—The use of the hammer mill to extract and clean hardwood seeds, as a seed scarifier, and for pulverizing peat and compost is described.

**Studies in raising southern pine nursery seedlings,** M. A. Huberman. (U. S. D. A.). (*Jour. Forestry, 38 (1940), No. 4, pp. 341–345*).—Studies conducted in the Stuart Forest Nursery, Louisiana, upon various cultural factors, such as mulching, time of sowing, and watering, which might affect germination indicated that these are not as important in respect to tree percentage as are methods of handling the seed prior to germination. In 1935 and 1936 the total losses following germination for longleaf pine and, in most cases, for

shortleaf pine were not nearly as great as the number of seeds failing to germinate. Neither root pruning nor shading of seedlings had any significant effect on percentage of plantable trees. Spacing of the young plants did affect the number of plantable trees, both plantable percentage and green weight increasing significantly with decreased density.

**Base exchange properties of nursery soils and the application of potash fertilizers,** S. A. WILDE and J. C. KOPITKE. (Wis. Expt. Sta. and U. S. D. A.). (*Jour. Forestry, 38 (1940), No. 4, pp. 330–332, fig. 1*).—Of all the exchangeable ions, K is said to present the greatest interest from the standpoint of nursery soil fertility. Except for a negligible amount in the soil solution, available K occurs in the form of an exchangeable ion, making the content of available K retained in the soil despite leaching dependent directly on the level of base-exchange capacity. Heavy applications of K to soils of low exchange capacity may result in considerable leaching losses. Based on the results of nearly 1,000 determinations made over a 7-yr. period on soil samples from 14 forest nurseries, suggested rates of application of K fertilizers to soils of different exchange capacities are presented. In case the base-exchange capacity of a nursery soil is low and there is need for a high level of available K, its maintenance is possible through the use of catch crops, composts, or liquid manures. The inclusion of peat or other matter of high base-exchange capacity may be helpful.

**Frost depth in forest and open in Connecticut,** R. KIENHOLZ (*Jour. Forestry, 38 (1940), No. 4, pp. 346–350, fig. 1*).—Determinations of frost penetration and emergence in northwestern Connecticut during the winters of 1937–38 and 1938–39 showed that it penetrated about twice as deep in the open as in the forest. Material on the forest floor lessened the depth of penetration, delayed the time of freezing of the mineral soil, and retarded thawing. Except in one instance, frost did not begin to emerge from the soil in both the forest and open until the snow cover had entirely disappeared. In every case, frozen soil began to thaw from both the top and bottom at the same time.

**The role of forest fires in the reproduction of black spruce,** R. K. LEBARRON. (U. S. D. A. and Univ. Minn.). (*Minn. Acad. Sci. Proc., 7 (1939), pp. 10–14, fig. 1*).—Black spruce, said to be the most valuable species in the making of paper, was observed to occur in many instances as even-aged stands on burned-over land. Over a period of 8 yr., 1931–38, not one complete cone crop failure occurred near Ely, Minn. The mature cones remained attached to the trees for several years, and the seeds were disseminated slowly over a period of at least 2 or 3 yr. Old and freshly matured cones picked in 1936 were sorted by age classes and the seeds extracted. Germinations of 60, 36, and 30 percent were recorded for fresh, 1-yr., and older cones, respectively. In 1937, collections of new and 1-yr. cones yielded seed of the same viability, 76 percent. Fires do not often reach the top cones of trees and they also destroy the surface vegetation and litter which normally interfere with germination of the seed and survival of the seedlings. Thus fires may permit black spruce to occupy sites where the species would normally occur in mixture with other species.

**Growth and mortality of ponderosa pine in relation to site of trees and method of cutting,** G. A. PEARSON. (U. S. D. A.) (*Jour. Forestry, 38 (1940), No. 4, pp. 323–327, figs. 3*).—Three experimental areas of *Pinus ponderosa* on the Coconino National Forest in Arizona, aggregating 455 acres, were logged by different methods in 1913, leaving volumes of 1,833, 2,846, and 4,510 bd. ft. per acre, respectively. In each case the trees left were selected for physical soundness and capacity for growth and seed production. Increment in board feet over a period of 20 yr. has been computed by diameter classes and expressed in percentage of the original volume of each diameter class. Death losses have been com-

puted in the same manner. Increment percentage is highest in the 12-in. class and declines rapidly as diameter increases, while mortality changes in the opposite direction. When plotted on the same scale, the curves of increment and mortality cross each other in the 30-in. class, indicating that, in general, trees above 30 in. diameter at breast height contribute only a net loss to the growth of the stand. This relation is almost identical on the three areas. Net increment per acre is highest on the light-selection cutting area on which the reserved volume was 4,510 bd. ft., and lowest on the scattered-seed-tree cutting where only 1,833 bd. ft. per acre were left.

**Progress of breeding investigations with Hevea brasiliensis: The Pilmoor crosses, 1928–1931 series,** C. C. T. Sharp (*Jour. Rubber Res. Inst. Malaya, 10 (1940), Commun. 248, pp. 34–66, fig. 1*).—Records taken on seedlings resulting from controlled crosses between selected parents and upon open-pollinated seedlings, of which only one parent was known, showed that the former were significantly superior in yield. These seedlings of known parentage are considered equal to the best clones, but it was not found that they were superior.

## DISEASES OF PLANTS

**[Phytopathological studies by the Florida Station].** (Partly coop. U. S. D. A.). (*Florida Sta. Rpt. 1939, pp. 83, 94, 117–122, 123–132, 133, 134, 139–141, 144, 165–169, 171, 172, 180, 184, 185, 190–193, fig. 1*).—Brief reports of progress by various members of the station and substation staffs (R. M. Barnette, J. R. Beckenbach, H. E. Bratley, A. N. Brooks, A. H. Eddins, B. R. Fudge, D. G. A. Kelbert, R. R. Kincaid, K. W. Loucks, J. R. Neller, A. S. Rhoads, G. D. Ruehle, W. B. Shippy, W. B. Tisdale, G. R. Townsend, R. K. Voorhees, M. N. Walker, J. R. Watson, G. F. Weber, and E. West) are included on chlorosis in corn plants and other field crops; root knot nematode control on vegetable crops by mulches and by resistant varieties; control of various diseases of potatoes, including bacterial wilt and soft rot, scab, virus diseases, blackleg, and seedling cross and variety test; brown rot of potato and related plants; comparative study of forms of *Diplodia* resembling *D. frumenti*; control of *Fusarium niveum* wilt and other diseases of watermelon; *Fusarium* tomato wilt control; *Clitocybe tabescens* root rot of citrus trees and other woody plants; a bark disease of Tahiti lime trees (cause unknown); fruit rots of grapes; host relations and factors influencing the growth and parasitism of *Sclerotium rolfsii* on various host plants; a hitherto unreported disease of beans due to an aerial species of *Rhizoctonia*; causes of failure of seed and seedlings in various Florida soils, with special reference to *Pythium* and *Rhizoctonia*, and preventive methods; comparative study of the pathogenicity and taxonomy of *Alternaria*, *Macrosporium*, and *Stemphylium*; control of diseases of potato and vegetable crops due to *Rhizoctonia*; *Sclerotinia sclerotiorum* pink rot and other diseases of celery and their control, including early blight; citrus gummosis and psorosis; dusting cucumbers for downy mildew; control demonstrations with tobacco downy mildew; *Colletotrichum* leaf spot of Nephthytis; *Sphaeropsis*-induced witches' broom of oleander; control of *Cercospora* leaf spot and powdery mildew of *Zinnia*; downy mildew resistant cantaloup and cucumber; control of dieback and scab of citrus trees, and of melanose and stem-end rots of the fruits; seed- and soil-borne diseases of vegetable crops, including potato seed-piece decay, and halo blight of beans; leaf blights of vegetable crops, including bean rust, bean breeding for quality and resistance to rust and powdery mildew, early blight of potato, and tomato spraying; physiological phases of plant nutrition, including the "puffing" disorder of tomato, bud drop of lima beans in the fall, and failure of pods of English peas to fill properly; weather conditions in relation to field and plant-bed diseases

of tobacco, and disease-resistant tobacco varieties; control of tobacco downy mildew; diseases of minor fruits and ornamental plants; control of potato diseases in Dade County; diseases of avocado and mango and their control; and tomato disease control.

**[Plant disease studies by the Georgia Coastal Plain Station].** (Partly coop. U. S. D. A.). (*Georgia Coastal Plain Sta. Bul. 30 (1939), pp. 89, 90, 111–114, 121–127, 130, 131, figs. 3*).—Brief progress reports are included on studies of tomato early blight as influenced by rainfall and humidity, seed treatments and sprays, and shipping conditions; root knot nematodes—their chemical control, active migration, spread from an infested area, and control in the field on various crop plants; diseases of flue-cured tobacco and their control, and a seasonal survey for 1938; and shade tobacco diseases.

**[Phytopathological studies by the New Jersey Stations]** (*New Jersey Stas. Rpt. 1939, pp. 33, 34, 36, 37, 86, 87, 89–99*).—Brief reports are included on studies of fungus diseases and the virus-induced false blossom of cranberries (coop. U. S. D. A.): blueberry disease studies; potato diseases, including dips for seed potatoes and soil treatments with particular reference to *Rhizoctonia* and scab, and spray and dust treatments of the vines; mercurial dips for scurf, the effect of soil reaction on pox, and dips for enhancing color and preventing rots of sweetpotatoes; vegetable disease control work, including bean rust, club root of crucifers, cantaloup spraying test for various diseases, eggplant wilt, lettuce diseases, mushroom bubbles or *Mycogone* disease, root knot on cucumbers, pepper mosaic, pea root rot, and sweet corn bacterial wilt; copper and sulfur sprays for apple scab and life history and ecological studies of the causal fungus; fungicidal control of cherry leaf spot; investigation of the principles underlying the cause of injury by copper fungicides; control of spur blight (*Mycosphaerella rubina*) on raspberries; and diseases of ornamentals, including *Sphaeropsis ellisii* on conifers, *Phomopsis* canker and bacterial leaf spot of gardenias, dieback of *Daphne cneorum*, and diseases of various ornamentals due to *Pestalotia* spp., *Colletotrichum* sp., and *Gloeosporium* spp.

**[Phytopathological studies by the Puerto Rico College Station]** (*Puerto Rico Col. Sta. Rpt. 1939, pp. 57–60*).—Brief reports of progress are given on diseases of bananas and plantains, banana leaf spot (*Cercospora musae*), pineapple diseases, and controlling diseases of yams, all by M. T. Cook and A. R. López; frequency of bordeaux injury on cucumbers, by A. Riollano; and diseases of papayas as limiting factors in their culture, by F. Julia, Riollano, and L. A. Serrano.

**The Plant Disease Reporter, [July 1 and 15, 1940]** (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 24 (1940), Nos. 12, pp. 233–250; 13, pp. 251–276, figs. 4*).—The following items of interest to phytopathology are included:

*No. 12.*—First report of bacterial ring rot in Arkansas, by S. B. Locke; appearance of azalea flower spot in Texas, by A. A. Dunlap; tulip failures due to fungi; tobacco diseases in Kentucky, by W. D. Valleau and E. M. Johnson; reports on bacterial wilt of sweet corn on Long Island, cereal diseases for Georgia, cereal rusts in the southern Plains States, and stem rust severe on wheat in California; reports on fruit diseases in New York and Wisconsin; plant disease check list revision, including *Abutilon* through *Aleurites*, by F. Weiss; and scab destructive on winter wheat in Maryland, Delaware, and Virginia, by A. G. Johnson.

*No. 13.*—First report of bacterial ring rot in Virginia, by H. T. Cook; some new or unusual occurrences of potato diseases in Louisianna, by L. H. Person; tomato curly top more severe in Utah than in 1939, by H. L. Blood; tomato curly top and other noteworthy plant diseases in the lower Rio Grande Valley, by G. H. Godfrey; plant disease notes from Massachusetts, by O. C. Boyd;

plant disease notes for Georgia, by J. H. Miller; some plant diseases reported from New York; a survey of cotton seedling diseases in 1940 and the fungi associated with them, by P. R. Miller and R. Weindling; and check list revision, including map of plant growth regions of the United States, use of *Corticium solani*, and plant disease check list of *Alnus* through *Ampelopsis*, by F. Weiss.

**Plant biology applied to agriculture.—III, Mycology—parasitic diseases,** R. PEROTTI (*Biologia vegetale applicata all'agricoltura.—III, Micologia—malattie parassitarie. Torino: Rosenberg & Sellier, 1940, vol. 3, 2, ed., pp. X+[2]+1191, figs. 401*).—This, one of a five-volume monograph on the biology of crop plants, discusses the general question of parasitic diseases, including morbid anatomy, and then proceeds to a consideration of specific diseases arranged by their causes—bacteria, ultramicroscopic parasites (viruses), Myxomycetes, and the various groups of the true fungi. A section on immunity in plants and general control measures, and author and subject indexes conclude the work.

**The rusts of Minas Geraes, Brazil, based on collections by A. S. Müller,** H. W. THURSTON, JR. (Pa. State Col.). (*Mycologia, 32 (1940), No. 3, pp. 290–309*).—This annotated check list includes descriptions of new species in the genera *Aecidium*, *Endophylloides*, *Prospodium*, and *Uredo*.

**Uredinales of New Guinea,** G. B. CUMMINS. (Ind. Expt. Sta.). (*Mycologia, 32 (1940), No. 3, pp. 359–375, figs. 14*).—Of the 34 species included, 20 are described as new in the genera *Puccinia*, *Uromyces*, *Corbuiopsora* n. gen., *Sphaerophragmium*, *Kuehneola*, *Crossopsora*, *Uredo*, and *Aecidium*.

**The toxicity of certain chemicals in aqueous solutions to spores of Penicillium expansum,** R. H. WELLMAN and F. D. HEALD. (Wash. Expt. Sta.). (*Phytopathology, 30 (1940), No. 8, pp. 638–648, fig. 1*).—Spores 7–15 days old were exposed to solutions of the chemicals for 1 min., placed in distilled water to prevent further action, and plated out with 2 percent potato-dextrose agar. Toxicity was measured by the relative number of colonies formed in treated v. control Petri dishes. Sodium ortho-phenylphenate at 4,000 p. p. m. or 2,500 p. p. m. of a mixture of sodium tetrachlorophenate and sodium 2-chloro-ortho-phenylphenate killed a high percentage of *P. expansum* spores. Of 9 triphenylmethane dyes tried, only crystal violet, gentian violet, and malachite green proved toxic, indicating a relationship between fungicidal activity and the number of methyl groups attached to the amino nitrogens. None of the 12 miscellaneous dyes tested exhibited fungicidal activity at 1,000 p. p. m. Sodium salicylate and thymol were the only 2 of 20 miscellaneous organic fungicides tested that completely inhibited colony formation at 10,000 p. p. m. Of the 25 inorganic chemicals tested, chromium trioxide, potassium dichromate, and sodium thiosulfate were fungicidal at 10,000 p. p. m. Iodine, mercuric chloride, and potassium mercuric iodide were effective at 1,000 p. p. m.

**The carbon and nitrogen metabolism of Stereum gausapatum Fries,** J. A. HERRICK (*Ohio Jour. Sci., 40 (1940), No. 3, pp. 123–129*).—"The fungus was found to grow well in culture with the following compounds as the only source of carbon: Xylose, dextrose, galactose, levulose, mannose, maltose, sucrose, raffinose, glycogen, inulin, and soluble starch. Rhamnose and arabinose were much less effective, and glycerine was found to be of very little value but did support some growth. That lignin and tannins may serve as food for the fungus is indicated by various experiments and observations. Synthetic media containing peptone supported a heavy growth of mycelium, but when the nitrogen was furnished only in the form of inorganic salts ($NH_4NO_3$, $NH_4Cl$, $(NH_4)_2SO_4$, $KNO_3$, $NaNO_3$, $NaNO_2$) or asparagine growth was not significantly greater than on a nitrogen-free medium. The fungus is therefore not able to

use appreciable amounts of nitrogen from such inorganic compounds. $NaNO_2$ is definitely quite toxic. The other compounds were shown to be nontoxic."

**Factors affecting spore germination and growth of Urocystis occulta in culture**, L. LING (*Phytopathology, 30 (1940), No. 7, pp. 579–591, figs. 2*).—Chlamydospores of *U. occulta* germinated at ±10°–25° C., but not at 5° and 30°. The optimum was ±15°. Temperature affected the rapidity more than the final percentage of germination; the substrate and certain chemicals affected both rapidity and percentage. Solid media, distilled water, tap water, and sugar solutions proved unfavorable, but the spores germinated well in soil infusions. Benzaldehyde at ±3 : 2,000,000 had a decidedly stimulating effect, while organic acids (malic, lactic, citric, and oxalic) failed to stimulate germination, and the effects of plant tissues were erratic. In general, spores germinated better in darkness or diffuse light than in direct sunlight, although this may have been partly a temperature effect. The optimum pH for spore germination was ±6.86, and there was no germination at 3.8, but 5 percent of the spores still germinated at 8.95.

*U. occulta* grew slowly on artificial media, the colonies of monosporous cultures attaining a maximum diameter of 45 mm. only after 10 weeks, with sectors commonly though not abundantly produced. Distinct lines were obtained by transferring from these sectors, but the origin of the sectoring is unknown, as the hyphal cells were binucleate or multinucleate and various combinations of nuclei may have occurred. Several hundred sporidial branches were cut from promycelia in attempts to isolate haploid lines, but only two were obtained. The latter differed from monosporous lines in cultural characters and failed to infect rye, either singly or in combination. Monosporous cultures grew on potato-dextrose and malt-extract agars at 5°–25°, the optimum being about 20°, which is ±5° higher than the optimum for spore germination. The organism grew moderately well on potato-dextrose agar initially at pH 5–9, the optimum being 6.2. On the solid media tried, potato-dextrose agar appeared best. Many carbohydrates (except rhamnose and levulose) supported fair growth, but levulose appeared toxic. Of the mineral elements, P, N, and Mg were indispensable. Expressed juices of sugar beet, dahlia, potato, and rye did not appreciably promote growth.

**Seed treatments for corn, oats, and barley in Arkansas**, V. H. YOUNG and C. K. MCCLELLAND (*Arkansas Sta. Bul. 389 (1940), pp. 27*).—Using five fungicidal dusts on Neal Paymaster corn (1928–30 and 1932) and taking data on total seedling emergence, final stands, and yields, no correlation was found between results and weather conditions during the planting season and under the test conditions no assured benefits were obtained from any of the treatments.

In a 6-yr. study of oat-seed treatments, certain dusts (1931–32) gave excellent control of loose smut, whereas others tried gave only fair or negligible control. None of the treatments used appeared to affect the stand or to have any marked effect on the ratio of straw to grain. Almost perfect control of smut was obtained by either formaldehyde spray or ethyl mercury dust methods (1933–36), and in addition (1931–32) to various experimental organic mercury dusts, the formaldehyde-dip and dust methods also gave practically perfect control of oat smut. Although yield increases were essentially in proportion to reductions in smut incidence when heavily smutted seed was used, differences in results from various treatments were insufficient to indicate that any of the treatments were more efficient than others in their effects on yields. Combined treatments using first a formaldehyde spray and then ethyl mercury dust with either badly smutted or clean seed gave no evidence of beneficial effects from ethyl mercury chloride dust other than through smut control. No evidence of stimulatory

effects or benefit on yields from the control of other seed- or soil-borne organisms was secured. It appears then that cost, ease of applying, and freedom from danger of seed injury are the determining factors in selecting a seed treatment for oats.

In tests (1936–38) with Missouri Beardless barley seed, both covered and loose smuts being present, the latter was controlled to a considerable degree by both the formaldehyde-soak and ethyl mercury phosphate dust treatments, as well as by the hot-water method. Partial control of loose smut by surface treatment indicated that a portion of the loose smut was due to *Ustilago nigra*. In the last 2 yr. there were indications that, in addition to infection from seed-borne smut, infection also resulted from spores (*U. hordei* and *U. nigra*) of the preceding season remaining over summer in the soil. There was also strong evidence that ethyl mercury phosphate dust gave definite protection against infection from soil-borne spores of both covered and loose smut, as well as from seed-borne spores of these fungi. The hot-water treatment and the formaldehyde-soak method afforded protection against seed-borne infection only. No significant differences in yield were noted. The extreme variation in yields among the control plats indicated that soil inequalities were probably the greatest factor in such variations.

**The influences of sowing depth and moisture on smut diseases, and the prospects of a new method of control,** G. H. Jones and Abd El Ghani Seif-El-Nasr (*Ann. Appl. Biol., 27 (1940), No. 1, pp. 35–57, figs. 11*).—The incidence of flag smut of wheat, covered smut of barley, and grain smut of millet and broomcorn in Egypt was found to depend very largely on methods of planting, analyzed into factors of depth of sowing and soil moisture. It is concluded that the influence of depth of sowing is probably due to lengthening of the susceptible stage of the host by deeper planting and to shortening of this stage by rapid emergence into unfavorable aerial conditions by shallow planting. On this assumption, theoretical curves of infection plotted against depth of planting were constructed, these curves bearing some resemblance to the actual curves of observed disease. The smaller influence of soil moisture proved to be constant, wet soil discouraging disease increasingly with depth, presumably due to lack of aeration. However, in exceptional cases, occurring only in deeper plantings in wet soil, the influence of moisture became so great that there was apparently a reversal of the influence of depth. The probable causes of such exceptions are discussed. It is believed that variation in depth of planting may be found useful in studies of seed- or soil-borne seedling diseases, since it seems to enable the effect of time to be separated and varied, within limits, independently of other factors. In the smuts it seems to operate by delaying the rupture of the coleoptile and the consequent onset of resistance of the seedling. In irrigated regions these results can be applied fully by sowing on the surface of water-soaked soil. The probable relative practical values of the three means of control—special planting methods, seed disinfection, and the selection of resistant varieties—are discussed. There are 36 references.

**Delayed reduction of the diploid nucleus in promycelia of Ustilago zeae,** S. P. Chilton. (U. S. D. A. and Minn. Expt. Sta.). (*Phytopathology, 30 (1940), No. 7, pp. 622, 623, fig. 1*).—Inoculations with monosporidial cultures from promycelia of chlamydospores of *U. zeae* germinating abnormally, made alone and in various combinations into young corn plants, indicated that both haploid and diploid sporidia (based on whether segregation for sex or compatibility factors had or had not occurred) were produced by the same chlamydospore in three cases. It is thus concluded that in *U. zeae* reduction of the diploid nucleus may be delayed past the first division.

**The initiation of infection by bunt of wheat (Tilletia caries),** J. G. CHURCHWARD (*Ann. Appl. Biol., 27 (1940), No. 1, pp. 58–64, pl. 1, figs. 3*).—The mode of penetration of wheat coleoptiles by *T. caries* was studied and a special method adopted for inoculating the coleoptiles to insure abundant mycelium. Cultures from single as well as from masses of secondary basidiospores and from chlamydospores were used as inocula. Two distinct types of superficial mycelium were observed on the coleoptile. One, derived from germinating secondary basidiospores, was narrow, not deeply stained, regular in outline, and occasionally branched. The other, resulting from fusion of two of the narrow-type hyphae, was shorter, irregular in outline, and more deeply stained. In it the nuclei were associated in pairs. No fusions occurred between hyphae of single spore cultures derived from a secondary basidiospore, so that in plants inoculated with these cultures "fusion hyphae" were absent. Attempts to induce hyphal fusion of compatible strains on media of various kinds failed. An appressorium formed below the fusion hypha. Where this contacted the plant cuticle between the epidermal cells, a small peg developed, and penetration, always intercellular, was effected. Immediately after penetration there was formed an irregular, swollen fungus cell into which the contents of the appressorium passed. In it the nuclei were associated in pairs. At the first cross wall this swollen cell bifurcated to form narrow, intercellular mycelium in which the nuclei were no longer associated. There are 19 references.

**Longevity of urediospores of crown rust of oats,** H. R. ROSEN and L. M. WEETMAN (*Arkansas Sta. Bul. 391 (1940), pp. 20*).—To determine the importance of urediospores of *Puccinia coronata avenae* produced in carrying the parasite from one crop season to another in the same general locality, oat leaves heavily infected with this stage were subjected to uncontrolled, natural conditions as well as to 45 combinations of controlled temperature and humidity, the range being from 5° to 40° C. and from ±0 to 90 percent relative humidity. Urediospores gathered in June and kept outdoors were found to survive less than 15 days. During each of the 2 yr. of these tests, the average temperature and humidity were high and were characteristic of average Arkansas conditions at that season. Spores kept at 5° and 10° and at 25 and 50 percent humidities showed greater longevity than those at higher temperatures or humidities. The difference in life span was very marked, ranging from less than 15 days under the higher temperatures and humidities to over 300 days under the lower conditions. Both humidity and temperature influenced longevity to a marked degree. Thus, below 25 percent or above 50 percent r. h. the spores were short-lived, irrespective of temperature.

The evidence indicates that no predictions are possible as to the severity of crown rust on a future crop based on the prevalence of rust on the current crop, so far as longevity of urediospores is concerned. It is concluded that, so far as race 1 is concerned (the common race in Arkansas), the urediospores produced on one oat crop are incapable of living long enough to perpetuate the disease on the succeeding crop under the existing climatic conditions, and that additional work is necessary to determine the sources of infection.

**A study of the relation between the seedling and mature-plant reaction to Puccinia graminis tritici in durum wheat crosses involving Iumillo,** W. H. WADDELL (*Canad. Jour. Res., 18 (1940), No. 6, Sect. C, pp. 258–272, fig. 1*).—The seedling reaction to race 21 of *P. graminis tritici* in the greenhouse was compared with the mature-plant reaction to all races present in the field, in three intradurum crosses involving Iumillo. All lines resistant in the greenhouse proved resistant in the field, but a large number of lines were susceptible at both seedling and mature stages. Another group contained lines susceptible

as seedlings but resistant as mature plants. However, increasing susceptibility in the seedling stage usually indicated the same trend in the mature plant. Most of the lines highly resistant as mature plants could have been selected as seedlings. Iumillo apparently possesses a factor or factors for mature-plant resistance as well as for resistance at both stages. The stem rust reactions in the hybrid lines did not appear to be inherited in a simple Mendelian manner, due apparently in the Iumillo × Mindum crosses to the presence of two types of resistance in Iumillo, while in the Pentad × Iumillo crosses the inheritance was complicated still more by the additional factors for resistance in the Pentad parent. In the cross Iumillo × Mindum there was apparently no correlation between seed color and resistance, and seed color was inherited in a simple 3:1 ratio, with red seed dominant. The results of the study indicate that simple and inexpensive greenhouse tests, in which but one physiologic race is used, may be employed to eliminate susceptible lines in the field in durum crosses involving Iumillo.

**Unseasonable germination of teliospores of Puccinia graminis tritici,** R. U. Cotter. (U. S. D. A. and Minn. Expt. Sta.). (*Phytopathology, 30 (1940), No. 8, pp. 689–691*).—Teliospores from durum wheat collected at St. Paul, Minn., in late summer (1939) germinated in November of the same year, although according to 10 years' previous observations germination would not have been expected until the following March or April. Not all collections germinated in November, nor did teliospores of other stem rust varieties germinate early. The basis for this case of germination without the usual rest period is unknown, but it is suggested that their formation on durum wheat late in the year may have been the factor responsible.

**Studies on browning root rot of cereals.—VI, Further contributions on the effects of various soil amendments on the incidence of the disease in wheat,** T. C. Vanterpool (*Canad. Jour. Res., 18 (1940), No. 6, Sect. C, pp. 240–257, figs. 4*).—These further studies of the effects of soil amendments on browning root rot are said to have substantiated earlier findings[3] as showing that phosphatic fertilizers and farm manure will give adequate control of *Pythium* root rot of wheat in infested prairie soils. The growth improvement induced is believed due to the production of a larger number of more rapidly growing roots, lessening the chances for infection and leaving more roots healthy, though the same percentage may be affected as in diseased plants exhibiting severe leaf discolorations. No actual increase in resistance was noted. Nitrogenous materials applied singly had virtually no effect on growth, but once ample P was added, further N applications gave substantially greater increases than phosphate alone, i. e., P was apparently the chief limiting factor. In preliminary tests, no difference was noted in the phosphate-fixing power of browning and normal soils. Typical browning soils responded irregularly to small applications of B, Cu, Mn, or Zn, but were not found seriously lacking in these elements. Moderate benefits resulted from heavy applications of gypsum and of S. Browning soil was also found deficient in phosphate for noncereals such as alfalfa, buckwheat, carrots, flax, lettuce, and sweetclover, though these crops were not attacked by the *Pythium* species pathogenic on cereals. The poor growth of the noncereals in browning soil thus appears due to nutrient deficiencies, whereas that of cereals is due to root-destroying fungi as well. In both cases P is believed the chief limiting factor. Ground cereal straw, sweetclover hay, and weed hay amendments gave moderate increases in the growth of wheat. No consistent differences were found in the C : N ratios of browning v. normal soils. The results as a whole suggest that two of the most practical means of

[3] Canad. Jour. Res., 13 (1935), No. 4, Sect. C, pp. 220–250, pl. 1, figs. 5.

meeting the browning root-rot problem are to supply supplemental nutrients as artificial fertilizers and to add organic residues or farm manure regularly to subject fields.

**Varied rice diseases,** E. M. CRALLEY. (Ark. Expt. Sta.). (*Rice Jour.*, *43* (*1940*), *No. 4*, *pp. 11, 12*).—This is a brief progress report on studies of varietal resistance and the effects of fertilizers, irrigation methods, and sulfur treatments on stem rot; control of leaf spot by developing resistant varieties; and the effects of the Mg : Ca ratio and irrigation methods on white tip, and its control by resistant varieties.

**Selenophoma on grasses,** R. SPRAGUE and A. G. JOHNSON. (U. S. D. A. and Oreg. Expt. Sta.). (*Mycologia*, *32* (*1940*), *No. 3*, *p. 415*).—*Septoria bromigena* and *S. donacis* are transferred to the genus *Selenophoma*.

**Notes on Septoria scalds of vetch and peas in Oregon,** R. SPRAGUE. (Oreg. Expt. Sta. and U. S. D. A.). (*Phytopathology*, *30* (*1940*), *No. 6*, *pp. 541, 542*, *fig. 1*).—*S. viciae* causes an important stem scald and leaf spot of winter vetches in western Oregon. A similar disease of Austrian winter peas is due to *S. pisi*.

**Powdery mildew of lespedeza,** H. W. JOHNSON, C. L. LEFEBVRE, and T. T. AYERS. (U. S. D. A.). (*Phytopathology*, *30* (*1940*), *No. 7*, *pp. 620, 621*, *fig. 1*).—A powdery mildew on various strains of annual lespedeza at Arlington, Va., was identified as due to *Microsphaera diffusa*. Though it has usually developed too late to cause serious losses, it appears to induce a certain degree of premature defoliation. From greenhouse data and field observations it is apparent that strains of *Lespedeza striata* are more susceptible than are those of *L. stipulacea*.

**Phytophthora cactorum as a cause of root rot in sweetclover,** M. W. CORMACK (*Phytopathology*, *30* (*1940*), *No. 8*, *pp. 700, 701*).—*P. cactorum*, shown to cause a root rot of sweetclover in Alberta, Canada, appears responsible also for the root rot of this host in the United States, previously attributed to *P. megasperma*. Moderate damage occurred in several widely separated areas of Alberta during early spring and summer. Mature sweetclover plants proved more susceptible than seedlings. Alfalfa was not attacked.

**Behavior of Phoma betae in the presence of boron** [trans. title], O. VERONA and I. DE MARCHI (*Ann. Facoltà Agr. R. Univ. Pisa*, *n. ser.*, *2* (*1939*), *pp. 645–654*, *figs. 5*; *Fr.*, *Ger.*, *Eng. abs.*, *pp. 645, 646*).—The studies reported led to the conclusion that boric acid in small doses stimulates growth of *P. betae*, whereas in comparatively large doses boric acid and sodium tetraborate (the latter more than the former) inhibit and even prevent growth. The fungus grew under comparatively acid conditions and was not injured by strongly alkaline agents. Antagonism was noted between *P. betae* and *Bacillus subtilis*.

**The effect of Cercospora beticola on the chemical composition and carbon assimilation of Beta vulgaris,** C. M. NAGEL and O. A. LEONARD. (Iowa Expt. Sta.). (*Phytopathology*, *30* (*1940*), *No. 8*, *pp. 659–666*).—In these experiments both field- and greenhouse-grown sugar beet plants were analyzed, diseased and healthy roots, crowns, petioles, and blades being compared. Results indicated that leaf spot materially reduces the percentage of sucrose in the crowns, roots, petioles, and blades. Total nitrogen in diseased roots was greater than in comparable healthy and pruned tissues, and small differences in pectin content were found. Roots and crowns of diseased plants were higher in soluble nitrogen than similar healthy and pruned tissues. Analysis of diseased and healthy leaves showed that the percentage of total nitrogen decreases with severity of infection. As leaves became more severely affected, their ability to assimilate $CO_2$ diminished.

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**The winter carry-over of angular leaf spot infection in Arizona cotton fields,** J. F. HARE and C. J. KING. (U. S. D. A.). (*Phytopathology, 30 (1940), No. 8, pp. 679–684, figs. 2*).—The angular leaf spot bacterium (*Phytomonas malvacearum*) may overwinter in Arizona on cottonseed remaining in the fields. Greenhouse plantings from seed collected in spring from old diseased areas exhibited a high proportion of infected seedlings, whereas control plantings of seed from disease-free fields remained healthy. Volunteer seedlings arising from diseased bolls plowed under proved to be sources of infection to cotton subsequently planted, probably through irrigation water or wind-driven rains. Preventive measures suggested for diseased fields include pasturing or burning the plant remains and early cultivation to destroy volunteers.

**Variation in the tolerance of certain physiologic races of Actinomyces scabies to hydrogen-ion concentration,** L. A. SCHAAL. (Minn. Expt. Sta.). (*Phytopathology, 30 (1940), No. 8, pp. 699, 700, fig. 1*).—*A. scabies* isolates from potato tubers growing in soils at pH 5.4 and 6.8, respectively, were each inoculated to potato dextrose agar cultures adjusted to pH 5.0 and 8.5. Both appeared identical on this medium when adjusted to pH 7. The strain from the more acid soil grew in this medium adjusted to pH 5.0, whereas the one from the less acid soil failed to grow at this pH value, appreciable growth being noted only on the medium at pH 6–8.5. Both isolates proved pathogenic on Katahdin and Green Mountain tubers grown in the greenhouse in a soil at pH 6.8. The isolate from the more acid soil produced only a shallow pustule, whereas the other produced a deep pustule. These strains are thus physiologic races which can be differentiated by pH tolerance in culture and by differences in pathogenicity.

**Some notes on a suspected variant of Solanum virus 2 (potato virus Y),** K. M. SMITH and R. W. G. DENNIS (*Ann. Appl. Biol., 27 (1940), No. 1, pp. 65–70, pl. 1*).—The authors describe and discuss an apparent variant of *Solanum* virus 2 (potato virus *Y*) differing slightly from the type virus in the symptoms induced and sharply in its longevity in vitro. This virus was accompanied in the tobacco plant by a necrotic symptom suspected of being due to a separate but very unstable virus.

**Relation of food translocation to movement of virus of tobacco mosaic,** C. W. BENNETT. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *60 (1940), No. 6, pp. 361–390, figs. 9*).—In vegetative Turkish tobacco plants with a main stem horizontally and a basal sucker vertically placed, basipetal movement of tobacco mosaic virus in the main stem was rapid and acropetal movement slow, while in similar plants maturing seeds on the main stem acropetal movement was rapid. In vegetative plants acropetal movement was accelerated by darkness and by defoliation, but basipetal movement was very slow in main stems in the dark. In *Nicotiana glauca* plants having top and basal grafts of Turkish tobacco separated by 3 ft. of stem, the virus moved from top to basal grafts and produced symptoms in 6–9 days, whereas, in 7 of 10 plants it failed to move from basal to top grafts in periods of 224–252 days. Upward movement was relatively rapid when the tops were defoliated. Turkish tobacco roots proved susceptible to infection, but usually long periods were required for the virus to move into the tops and induce symptoms. Removal of the tops hastened this upward movement. Tobacco mosaic virus moved through rings that broke the phloem continuity in the Turkish tobacco stems, but passage was delayed. In certain *N. glauca* plants the virus failed to pass such rings in periods some of which exceeded 250 days. However, cucumber mosaic virus passed such rings in all cases, although passage was delayed.

Since tobacco mosaic virus usually fails to induce mottling on *N. glauca*, *it is suggested that the parenchymatous tissue of this species may be un*favorable for movement and multiplication, which may account for the *inability of the virus to pass rings breaking the phloem continuity.* The fact that the virus of cucumber mosaic, which causes mottling on *N. glauca* and therefore probably occurs abundantly in the parenchyma, passed such rings in all instances lends support to this concept. The evidence indicates that the movement of tobacco mosaic virus is correlated with food transport. The factors involved in movement probably do not differ fundamentally from those responsible for the movement of other plant viruses.

**Evidence of passive immunization of tobacco, Nicotiana tabacum, from the virus of curly top,** J. M. Wallace. (U. S. D. A.). (*Phytopathology, 30 (1940), No. 8, pp. 673–679, fig. 1*).—After recovery from this disease Turkish tobacco plants exhibited mild symptoms and were not visibly affected on reinoculation. However, when the insect vector transferred the virus from recovered to healthy plants the latter developed severe symptoms, indicating that the recovered plants contained the virus unaltered in virulence. On the other hand, healthy plants infected by grafting with scions from recovered plants developed mild symptoms only. It is therefore suggested that protective substances or properties transferable by grafting may be present in recovered plants. When scions were taken from leafhopper-inoculated plants at 5-day intervals after inoculation and grafted to healthy plants, it was indicated that 20 days or more were required for inoculated plants to develop maximum effectiveness in affording protection. Since this ac*quired tolerance of recovered plants was apparently not due to the presence* of an attenuated or mildly reacting virus strain, and because it was trans*ferable by grafting, these plant-virus reactions are described as* "acquired" immunity. The protection to healthy plants afforded by grafting to recovered plants is said to resemble certain types of passive immunization as understood in the animal field.

**The thixotropic character of the tobacco-mosaic virus protein,** V. L. Frampton. (Cornell Univ.). (*Phytopathology, 30 (1940), No. 8, pp. 666–673, figs. 3*).—This virus protein was found to form thixotropic sols when dispersed in water. The protein particles in "solution" not only failed to show all the properties of molecules, but they also failed to exhibit the most characteristic property of molecules in solution, viz, that of unrestricted thermal motion. The question is thus raised as to the validity of some interpretations of physical measurements hitherto made on the protein.

**Infectivity of tobacco mosaic virus in liquids over 14 years old,** E. M. Johnson and W. D. Valleau. (Ky. Expt. Sta.). (*Phytopathology, 30 (1940), No. 8, pp. 697, 698*).—As measured by ability to cause necrotic spots, this virus proved about one-third as infective when stored for 14 yr. in cork-stoppered flasks to which benzene and xylene, respectively, had been added as fresh material diluted similarly with water. Under the test conditions, toluene had no preservative effect. Ground frozen shoots of mosaic tobacco and air-dried mosaic tobacco, each mixed with water and stored without preservative, retained a low degree of infective power after 14 yr.

**The history of tobacco downy mildew in the United States in relation to weather conditions,** N. E. Stevens and J. C. Ayers. (Univ. Ill.). (*Phytopathology, 30 (1940), No. 8, pp. 684–688, fig. 1*).—On the assumption that weather conditions in Florida and Georgia during the years of epidemic incidence of tobacco downy mildew (1937 and 1932) must have been very favorable to the disease, it is pointed out that the years of initial outbreak in these regions

(1921–31) were apparently not particularly favorable and the appearance of the disease in those years may well have resulted from independent introductions.

**Seasonal occurrence of tomato diseases in Florida**, G. F. Weber and D. G. A. Kelbert (*Florida Sta. Bul. 345 (1940), pp. 36, figs. 22*).—This handbook considers the losses due to tomato diseases, environal effects on them, and their seasonal development, including discussions of seed selection and disinfection, seedbed preparation, soil disinfection, damping-off, soil preparation and plant setting, fungicides and their application, rotation, fertilizers and their application, cultivation, harvesting, and packing and transportation.

**Fruit stripe of tomato caused by a tobacco type 1 virus**, L. K. Jones. (Wash. Expt. Sta.). (*Phytopathology, 30 (1940), No. 6, pp. 538–540, figs. 2*).—A virus infection of tomato exhibiting mosaic of the foliage and chlorotic to necrotic stripes on the fruit appeared spontaneously in field plats at Pullman, Wash. The virus characteristics were similar to those of tobacco type-1 virus.

**The effect of zinc deficiency upon the root of Lycopersicum esculentum**, E. T. Eltinge and H. S. Reed. (Univ. Calif. et al.). (*Amer. Jour. Bot., 27 (1940), No. 5, pp. 331–335, figs. 4*).—Using three methods found to give harmonious results in studying Zn deficiency, the authors investigated its effects on the growth of cells and tissues of tomato roots, and compared the systemic effects with those in the leaves. Roots exhibited a series of swellings and an irregular distribution of root hairs. The roots themselves were moniliform in shape, and the swellings were marked with tufts of root hairs, many of which were extremely crooked and showed other abnormal characteristics. Secondary roots tended to develop at such nodular enlargements. The tip of the main root often died, and elongation was continued by the growth of a cluster of secondary roots breaking through near the dead tip. These secondary roots exhibited signs of Zn deficiency, consisting mainly of enlarged cells and necrotic areas. Microscopically, more profound evidences of abnormality were seen. Cells in the meristematic region were seriously deranged, as evidenced by their hypertrophy, by numerous air spaces among them, and by irregular arrangements of the cell layers. The cytoplasm in affected cells contained many spiral and elongated mitochondria, and the nuclei very small nucleoli. Under appropriate tests, it was noted that there were several abnormal products of metabolism in the cell vacuole, tannin, calcium oxalate, and fats being abnormally abundant. On the contrary, starch was absent. The changes indicated very serious derangement of the normal cellular metabolism. There are 19 references.

**Effects of calcium deficiency upon the roots of Pisum sativum**, H. Sorokin and A. L. Sommer. (Ala. Expt. Sta.). (*Amer. Jour. Bot., 27 (1940), No. 5, pp. 308–318, figs. 13*).—Using seedlings grown in Pyrex containers and in nutrient solutions of water redistilled from Pyrex plus carefully purified salts, the effects of the absence of Ca and of concentrations of 0.06, 0.125, and 0.25 p. p. m. were studied on the development of shoots and roots and on changes in the tissues and cells of the root system. No appreciable difference was found in the development of shoots under the treatments noted, and all were dead after 3 weeks. However, in the roots without Ca the normal mitotic processes were disturbed, polyploid nuclei, binucleate cells, constricted nuclei, and stages of amitotic division being observed. The tissues lacked resistance to infection. In roots fed 0.06 p. p. m. of Ca, there were normal cell divisions after 7 days, but after 15 days the cells were like those without Ca. Fed 0.125 p. p. m. Ca, normal divisions occurred after 15 days, but after 20 days aberrant types were seen. At 0.25 p. p. m. Ca, normal mitotic divisions were present to the end of the test, failure of the plants to develop normally being attributed to Ca functions not indicated by cell changes. The complex reactions of cells and tissues to the absence of Ca may be divided into two types, viz, those also induced by other agencies and

those peculiar to Ca deficiency alone. Polyploidy, formation of binucleate cells, and premature development of tracheal elements and primordia of lateral roots occur after treatment of tissues by agents causing changes in viscosity, surface tension, and permeability, and thus such changes in Ca-deficient solutions could be ascribed to similar properties of the Ca ion. However, the suppression of mitotic processes in the absence of Ca and the gradual appearance of aberrant types of division as traces of Ca are removed from the solution suggest that a very small amount may be required as a chemical constituent of the protoplast. There are 22 references.

**Three previously undescribed mosaic diseases of pea,** W. J. ZAUMEYER. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *60* (*1940*), *No. 7, pp. 433–452, figs. 4*).—These 3 new viruses, together with an earlier described mosaic virus from alsike clover, also infectious to pea, are described and identified. They were pea mosaic virus 4, pea mosaic virus 5 (pea stunt mosaic), alsike clover mosaic virus 1, and alsike clover mosaic virus 2. Pea mosaic virus 4 and alsike clover mosaic virus 1 produced comparatively mild symptoms on pea. Pea mosaic virus 5 produced considerable stunting of Dwarf Telephone and Tall Telephone peas. Alsike clover mosaic virus 2 caused the most severe symptoms on peas, producing necrosis and leaf drop. The 4 viruses were inoculated into 12 varieties of peas, all proving susceptible except Horal, Little Marvel, Perfection, Surprise, and Wisconsin Early Sweet. The 4 viruses were also infectious on certain bean varieties, but with considerable varietal differences in susceptibility and symptoms. Stringless Green Refugee was susceptible to the 4 viruses. Great Northern U. I. No. 1 was resistant to all except pea mosaic virus 5. Pea mosaic virus 4 was the only one infecting red clover. Susceptible hosts were restricted to the Leguminosae. With few exceptions, hosts susceptible to one virus were susceptible to all.

**Probability of sweet corn wilt in 1940** (*New Jersey Stas. Plant Disease Notes, 17* (*1940*), *No. 12, pp. 45–48, fig. 1*).—On the basis of the preceding winter weather records and backed by similar observations since 1926, the indications are said to be that bacterial wilt of sweet corn will not be severe in 1940. Details are discussed, and curves of wilt severity and winter temperature indexes (1926–40) are presented.

**Additional facts regarding bacteriophage lytic to Aplanobacter stewarti,** R. C. THOMAS. (Ohio Expt. Sta.). (*Phytopathology, 30* (*1940*), *No. 7, pp. 602–611*).—In continuation of these studies (E. S. R., 73, p. 492), a nonspecific phage precursor inactivated by heating at 56° C. for 30 min. was found in many kinds of plants, e. g., rye. When it came into contact with susceptible bacteria, a reaction occurred resulting in the formation of a transmissible lytic principle not inactivated at 60° and only partly so at 65°. This is believed to be the origin of the bacteriophage in plants and to function as a mechanism of resistance. These lytic principles varied with differences in cultures of the bacteria used to produce them. In corn varieties susceptible to bacterial wilt, the phage precursor was lacking or very weak, whereas in resistant varieties it was strong. Several methods were found effective in rendering cultures of *A. stewarti* (=*Phytomonas stewartii*) free from the bacteriophage.

**A method of inducing spore production by Cercospora apii Fres. in pure culture,** R. W. LEWIS. (Mich. State Col.). (*Phytopathology, 30* (*1940*), *No. 7, p. 623*).—Young or old cultures of *C. apii* formed abundant conidia on sterilized celery leaves in contact with moist, sterilized soil, but cultures losing their characteristic color failed to develop spores under these conditions.

**Fruit diseases in 1938,** O. C. BOYD (*Mass. Fruit Growers' Assoc. Rpt., 45* (*1939*), *pp. 41–45*).—A brief seasonal survey of weather conditions and diseases of pome, stone, and small fruits for Massachusetts.

**Observations on the varietal susceptibility of apples to Gymnosporangium juniperi-virginianae,** J. S. NIEDERHAUSER and H. H. WHETZEL. (Cornell Univ.). (*Phytopathology, 30 (1940), No. 8, pp. 691–693*).—During a severe cedar-apple rust epidemic (1939), 25 apple varieties were examined as to relative susceptibility. Although 3 rust species (*G. juniperi-virginianae, G. globosum,* and *G. clavipes*) were abundant on a cedar tree apparently serving as the source of inoculum, only the first species seemed to be involved in the rust attack on the apple trees studied. It was also remarkable that only one fruit from all the trees examined showed a rust lesion. A table is presented comparing the authors' observations on the relative susceptibility of apple varieties to *G. juniperi-virginianae* with records by others. It is suggested that only one race was involved in the studies presented, and that this race is the same as that reported by Bliss in Iowa for 1928–30 (E. S. R., 70, p. 790).

**The Coryneum disease of stone fruits in Argentina, C. carpophilum n. comb.** [trans. title], C. JAUCH (*Rev. Argentina Agron., 7 (1940), No. 1, pp. 1–26, pls. 6, figs. 3; Eng. abs., p. 24*).—The paper presents descriptions of the disease and of the parasite, discussing the taxonomy of the latter and proposing the new combination *C. carpophilum* for it. The injuries caused are pointed out and the reasons why the disease varies in economic importance among the hosts—peach, almond, plum, apricot, and cherry. In Argentina, the geographical distribution of the disease is general in all fruit-producing districts. The characteristics of the fungus in single-spore cultures were studied, including the influence of temperature on growth and spore germination. Cross-inoculations of the fungus from leaf, twig, bud, or fruit among the host species and different plant organs are reported as successful, and the comparative varietal reactions are presented. There are 20 references.

**Effects of H-ion and Al-ion concentrations on damping-off of conifers and certain causative fungi,** L. W. R. JACKSON. (U. S. D. A. et al.). (*Phytopathology, 30 (1940), No. 7, pp. 563–579, figs. 3*).—Sodium glycerophosphates as phosphate sources produced a nutrient solution stable in the presence of Fe- and Al-ions at pH 2.5–8.5 and satisfactory for growth of the fungi and hosts studied. The growth of the *Pythium* isolates in liquid culture was zero at pH 2.5 and 3.5, increased to maxima at pH 5.5 and 6.5, and at pH 8.5 it was again zero in all but one series. Chlamydospore and oospore production was definitely less at pH 4.5 than at 6.5 in the absence of sugar. The growth of the *Rhizoctonia* isolates in liquid culture was zero at pH 2.5, very small at pH 3.5, definitely more at pH 4.5, 5.5, and 6.5, less at 7.5, and very small at 8.5. The amount of sclerotia was zero at pH 3.5 and 4.5, more at pH 5.5 and 6.5, and zero at pH 7.5 and 8.5.

The amount of damping-off by *Pythium* and *Rhizoctonia* isolates on ponderosa pine and Douglas fir grown in liquid cultures was lowest at pH 2.5 and 3.5, increased to maxima at 6.5, or less often 5.5, and decreased at 6.5 or 7.5. In the quartz-sand cultures the relationship between pH and damping-off was not so consistent. The amount of damping-off was low in all the series run at pH 2.5, the maxima occurring in the series as follows: 1 at pH 3.5, 2 at 4.5, 2 at 5.5, 3 at 6.5, 4 at 7.5, and 2 at 8.5. There were 2 maxima in 2 of the series. Aluminum exhibited only barely or doubtfully significant effects on damping-off in sand cultures at pH 3.5 with a 0.0005 M concentration of $Al_2(SO_4)_3$. The Al concentrations showed no effect in the series at pH 6.5. Both with and without Al the damping-off percentages were definitely higher at pH 6.5 than at 3.5. Practically the lower limit for the roots of the hosts in the liquid and quartz-sand cultures was at pH 2.5. Seedling growth was excellent at pH 3.5–6.5, but many cultures showed definite decreases, espe-

cially in root growth, at pH 2.5, 7.5, and 8.5. The strongest concentration of $Al_2(SO_4)_3$ used (0.0005 M) was near the limit for roots of the hosts. There are 26 references.

**Atropellis species from pine cankers in the United States,** M. L. LOHMAN and E. K. CASH. (U. S. D. A. et al.). (*Jour. Wash. Acad. Sci., 30 (1940), No. 6, pp. 255–262, figs. 2*).—"The genus *Atropellis* is revised to include, along with *A. pinicola* Zeller and Goodding, of the Pacific Northwest, two new species, namely, *A. tingens* and *A. arizonica*, and *Cenangium piniphilum* Weir, all of which cause characteristic cankers of pines. Of these, *A. tingens* is of widest occurrence on various species of native and introduced pines in the eastern half of the United States, and *A. arizonica* is most limited in distribution, being known only from the type locality, Safford, Ariz. Each of the species produces a localized, dark stain of the wood in cankered twigs or stems."

**Mycelial extent beyond blister rust cankers on Pinus monticola,** J. EHRLICH and R. S. OPIE. (Univ. Idaho). (*Phytopathology, 30 (1940), No. 7, pp. 611–620, fig. 1*).—*Cronartium ribicola* mycelium in the distal ends of 116 cankers on green stems and branches and proximal ends of 146 cankers on green stems and green and flagged branches from three ecologically comparable areas in one northern Idaho locality was found to extend ±0.5 to 3 (mean 1.66) cm. beyond the externally visible canker margins. No practical mean difference was found between distal and proximal measurements, or, for each type of canker, between measurements for the different areas. Mean extents were ±2.3 cm. for cankers on green stems, ±1.5–1.6 cm. for cankers on green branches, and ±1.2 cm. for cankers on flagged branches. Of 4 possibly related and readily determinable canker characters studied, diameter of cankered internode at the outer limits of surface discoloration was found to be most closely correlated with mycelial extent and to be most readily and accurately determinable in the field.

**A needle-cast of Douglas fir associated with Adelopus gäumanni,** J. S. BOYCE (*Phytopathology, 30 (1940), No. 8, pp. 649–659, figs. 2*).—This disease of *Pseudotsuga taxifolia* (=*P. douglasi*), reported first in Switzerland in 1925, has also been found in southern Germany, Denmark, Great Britain and Northern Ireland, and in New England. Severe infection induces progressive defoliation followed by death of the tree. No control method is known, but there is said to be a possibility of resistant races or individual trees. The fungus is present but nonpathogenic on living *P. taxifolia* on the Pacific coast, and it may have been introduced into New England and Europe from this region.

**Galls on Pseudotsuga macrocarpa induced by Bacterium pseudotsugae,** C. O. SMITH. (Calif. Citrus Expt. Sta.). (*Phytopathology, 30 (1940), No. 7, p. 624, fig. 1*).—Galls were induced on seedlings of *P. macrocarpa* and seedlings of *P. taxifolia glauca* by a culture of *B. pseudotsugae* furnished by H. N. Hansen, University of California. These galls resembled those described by Hansen and Smith (E. S. R., 69, p. 541; 77, p. 648).

**Coryneum blight of oriental arborvitae caused by Coryneum berckmanii n. sp.,** J. A. MILBRATH. (Oreg. Expt. Sta.). (*Phytopathology, 30 (1940), No. 7, pp. 592–602, figs. 3*).—A *Coryneum* with 5-septate spores is reported to have caused enormous losses of Oriental arborvitae in nurseries of the Pacific Northwest. Its chief host is *Thuja orientalis conspicua*, but all varieties of this species appear susceptible. The disease is characterized by blighting of small branchlets, which turn a reddish brown, fading to light gray. Black spore pustules are scattered on the infected scale leaves or in groups where small stems have been girdled by the fungus. The fungus, described as *C. berckmanii* n. sp., can be readily distinguished from other 5-septate spore

species reported on conifers, including *C. cardinale* on *Cupressus macrocarpa*. Spray tests during 1938–39 on several hundred infected trees demonstrated that the disease can be controlled by one application applied before infections are started by early fall rains. Basic $CuSO_4$ and red copper oxide gave better control than the other fungicides tried.

**Isolation of Ceratostomella ulmi from Scolytus multistriatus adults stored at different temperatures,** C. S. Moses and C. H. Hoffmann. (U. S. D. A.). (*Phytopathology, 30 (1940), No. 8, pp. 701, 702*).—Artificially contaminated adult bark beetles were placed in individual capsules and stored in lots of 50 at 70°, 60°, 40°, 28°, and −10° F., and one lot from each temperature was cultured at the end of 30, 60, 90, and 120 days. Storage temperatures did not materially affect recovery of the Dutch elm disease fungus at the end of 60 days. For longer intervals, temperatures of 40° F. or lower were needed. In all cases, storage at −10° yielded cultures with fewer contaminants.

**A new host for Taphrina dearnessii and geographic distribution of Taphrina on North American maples,** A. E. Jenkins and W. W. Ray. (U. S. D. A. and Okla. A. and M. Col.). (*Mycologia, 32 (1940), No. 3, pp. 408–414, figs. 4*).—A *Taphrina* species found on mountain maple (*Acer spicatum*) near Ithaca, N. Y., was identified as the *T. dearnessii* recently described on red maple from the United States and Canada (E. S. R., 81, p. 390). In the *Taphrina* group on North American maples this is said to be the second case of one species infecting two different hosts, and the first of two species infecting the same host. The other species described on mountain maple is *T. lethifera*. The first record of *T. dearnessii* west of the Mississippi River, in Oklahoma, is given, and the known distribution of the entire group is mapped.

**A leafspot fungus on Nyssa,** F. A. Wolf (*Mycologia, 32 (1940), No. 3, pp. 331–335*).—The fungus associated with this leaf spot of tupelo (*Nyssa* spp.) has usually been identified as *Phyllosticta nyssae*, which is apparently limited to the southeastern United States. However, studies have indicated that *P. nyssae* is not a pycnidial stage but a spermogonial stage. Lesions appear during later summer when punctiform fructifications develop on the lower leaf surface. They occur singly and consist of interspersed spermogonia and perithecial primordia. The spermogonial stage was found to be identical with *P. nyssae*. By the following spring the perithecial primordia are transformed into mature perithecia of *Mycosphaerella nyssaecola* n. comb. Evidence of the presence of conidia in the developmental cycle of *M. nyssaecola* is lacking.

**Fern diseases and pests,** B. O. Dodge (*Jour. N. Y. Bot. Gard., 41 (1940), No. 485, Sect. 1, pp. 116, 117, fig. 1*).—Prothallium maladies, leaf spots, black molds, nematodes, thrips, and scale insects are briefly discussed as being the more important troubles of ferns in greenhouse or outdoor plantings.

**Lily mosaic,** C. H. Gadd and C. A. Loos (*Trop. Agr. [Ceylon], 94 (1940), No. 3, pp. 160–167, pls. 3*).—The authors describe a mosaic disease of Easter lilies in Ceylon, shown to be transmissible by aphids to other lily plants. The virus was also experimentally transmitted to cucumbers, tomatoes, and turnips, but in these plants the mosaic symptom failed to become systemic. The symptoms induced are not exactly like those described for cucumber virus 1 elsewhere, but, though a critical study of the Ceylon virus has not yet been made, it is believed to be a variant of cucumber virus 1 rather than an entirely unrelated virus.

**Clean soil for clean corms solves gladiolus yellows problem,** L. McCulloch. (U. S. D. A.). (*Florists' Rev., 86 (1940), No. 2214, p. 29*).—Though only two experiments, one in the greenhouse and one out-of-doors, had been carried

out, the results in controlling the *Fusarium* yellows with chloropicrin were so clean-cut that they are here briefly reported.

**Diseases of the gardenia,** P. P. PIRONE (*New Jersey Stas. Bul. 679 (1940), pp. 10, figs. 7*).—A summary of information on the parasitic and nonparasitic diseases and their control and on the cultural requirements of gardenias.

**Gardenia leaf spot caused by Rhizoctonia** (*Florists' Rev., 86 (1940), No. 2217, p. 22*).—This is believed to be the first report of a *Rhizoctonia* leaf spot of cultivated gardenias. Preliminary studies afford evidence that the fungus is at least a new strain, and its pathogenicity for gardenia has been demonstrated by pure culture inoculation. Various strains and varieties proved susceptible, though under natural conditions the disease has thus far been confined largely to the variety Pride of Daisy Hill. Suggested control measures are given.

**Fumigation injury of chrysanthemum,** L. K. JONES. (Wash. Expt. Sta.). (*Phytopathology, 30 (1940), No. 6, pp. 540, 541, fig. 1*).—Following fumigation with Nico-fume for aphid control, a ring of brown, dead, floral parts appeared on Whittier chrysanthemum blooms. No injury was observed on 25 other varieties grown under similar conditions.

**The inefficacy of methyl bromide fumigation against the chrysanthemum foliar nematode,** J. R. CHRISTIE and G. S. COBB. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc., 7 (1940), No. 1, p. 62*).—The test reported is believed to eliminate methyl bromide fumigation as a method of treating chrysanthemum or other plants infested with this nematode, *Aphelenchoides ritzemabosi*, nor is it deemed likely that such treatment will be effective against the strawberry bud nematode, *A. fragariae*.

**Methods of clearing screen residues in separating nematodes from soil,** G. THORNE. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc., 7 (1940), No. 1, pp. 53, 54*).—*Opuntia* sp., saliva, and milk are reported as successfully used to settle screenings.

**Three fungi destructive to free-living terricolous nematodes,** C. DRECHSLER. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 30 (1940), No. 6, pp. 240–254, figs. 3*).—*Haptoglossa heterospora* n. gen. and sp. and *Meristacrum asterospermum* n. gen. and sp., two phycomycetous fungi, and *Cephalosporium* sp. are described and discussed. There are 26 references.

**Some host plants of the reniform nematode in Hawaii,** M. B. LINFORD and F. YAP. (Hawaii. Pineapple Prod. Expt. Sta.). (*Helminthol. Soc. Wash. Proc., 7 (1940), No. 1, pp. 42–44*).—A list of 65 host plant species representing 30 families mostly among the angiosperms is presented, and the host-parasite relationships of this nematode (*Rotylenchulus reniformis*) are discussed briefly.

**Duboscqia penetrans n. sp. (Sporozoa, Microsporidia, Nosematidae), a parasite of the nematode Pratylenchus pratensis (de Man) Filipjev,** G. THORNE. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc., 7 (1940), No. 1, pp. 51–53, fig. 1*).—*D. penetrans*, a new species of sporozoan, is described and its life history and host specificity to *P. pratensis* are discussed.

**Onion bloat or eelworm rot, a disease caused by the bulb or stem nematode, Ditylenchus dipsaci (Kühn) Filipjev,** B. G. CHITWOOD, A. G. NEWHALL, and R. L. CLEMENT. (U. S. D. A., Cornell Univ., et al.). (*Helminthol. Soc. Wash. Proc., 7 (1940), No. 1, pp. 44–51, figs. 5*).—The authors give the history and symptoms and present general control considerations.

**Rotylenchulus reniformis, nov. gen., n. sp., a nematode parasite of roots,** M. B. LINFORD and J. M. OLIVEIRA. (Hawaii. Pineapple Prod. Expt. Sta.). (*Helminthol. Soc. Wash. Proc., 7 (1940), No. 1, pp. 35–42, figs. 3*).—The taxonomy and life history of this nematode from cowpea roots are discussed, including the characterization of this new genus and species of the Tylenchidae.

## ECONOMIC ZOOLOGY—ENTOMOLOGY

**The warblers of New Jersey.—II, The transient warblers, L. A. Hausman** (*New Jersey Stas. Bul. 678 (1940), pp. 32, figs. 15*).—This second part of the author's contribution on warblers (E. S. R., 80, p. 69) is the eleventh in the station series dealing with the birds of New Jersey. Following a discussion of the head patterns of transient warblers, a simplified key for their identification and a key to the common songs of such warblers are presented. Thirteen forms additional to the 23 noted earlier are then dealt with, particular attention being given to their identification and occurrence in the State, namely, Tennessee, Nashville, magnolia, Cape May, myrtle, bay-breasted, black polled, palm, yellow palm, Kentucky, Connecticut, mourning, and Wilson's warblers.

**External parasites of sheep in Illinois: A portable dipping vat, W. E. McCauley and H. G. Russell** (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 547–550, figs. 5*).—Following a report of a survey to determine the prevalence of sheep parasites in which lambs chosen at random from representative flocks were examined, a description is given of a portable dipping vat constructed at a cost of approximately $270 for materials and labor.

**The genus Hymenolepis Weinland 1858, R. C. Hughes** (*Oklahoma Sta. Tech. Bul. 8 (1940), pp. 42*).—A compendium of the tapeworm genus *Hymenolepis* which contains more than 300 recognized species and subspecies parasitic in various birds and mammals as definite hosts. Offered as an introduction, it is to be supplemented by a descriptive key to the genus now in preparation.

Following a brief introduction, the work takes up the synonymy of the genus (pp. 5, 6), the forms belonging thereto, of which 320 are noted (pp. 6–24), nonvalid *Hymenolepis* specific names, some 159 in number (pp. 24–27), a host catalog of the species of the genus arranged by orders (pp. 27–36), and a bibliography of recent work (pp. 36–42).

**A comparative study of the insect food of trout, W. F. Morofsky.** (Mich. State Col.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 544–546*).—The investigation here reported was conducted with a view to comparing the number of insects eaten by brook, brown, and rainbow trout. The data presented were obtained from the examination of 1,548 trout stomachs collected in both northern and southern Michigan streams. The details of the findings are presented in 6 tables.

**[Work in economic entomology by the Florida Station].** (Partly coop U. S. D. A.). (*Florida Sta. Rpt. 1939, pp. 93, 94–99, 113, 114, 145–147, 154, 155, 158, 159*).—The work of the year (E. S. R., 81, p. 238) referred to includes miscellaneous observations, particularly on the pepper stem weevil *Collabismodes cubae* Boh.; the Florida flower thrips *Frankliniella cephalica bispinosa* Morg. and the onion thrips, both by J. R. Watson; the introduction and propagation of beneficial insects, by Watson and W. L. Thompson; the larger plant bugs (the southern green stinkbug, *Trichopoda pennipes*, and the leaf-footed bug), by H. E. Bratley; control of fruit and nut crop insects, particularly the nut case-bearer, by S. O. Hill, Watson, and Bratley; the gladiolus thrips, by Watson and J. W. Wilson; biology and control of Florida aphids, including *Aphis tulipae* Fonsc. and *A. nociadae* Ckll., by A. N. Tissot; the pepper weevil, by Watson and R. N. Lobdell; life history, food preferences, ecological distribution, and control of the eastern lubber grasshopper, by Watson and Bratley; studies of *Orthaea longulus*, the striped cucumber beetle, the melonworm, and the pickleworm, by Lobdell; fumigation of pecans, nursery stock, and seeds, by R. J. Wilmot; control of purple scale and whiteflies with lime-sulfur, by W. L. Thompson at the Citrus Substation; and control of the bean

jassid, the fall armyworm, and wireworms (*Melanotus communis* (Gyll.)) affecting sugarcane, corn, and truck crops and studies of the prevalence and control of the sugarcane borer and of rodents under field and village conditions, all by Wilson at the Everglades Substation.

**[Work in economic zoology and entomology by the New Jersey Stations]** (*New Jersey Stas. Rpt. 1939, pp. 27–29, 32, 33, 35, 36, 45–54, 64, 125, 126*).—The work of the year (E. S. R., 82, p. 217) with oysters reported upon relates to the production of oyster seed, open shore culture of oysters, pest control, and studies of the filtration of water by oysters and the factors which influence it. The entomological work includes that with the cranberry leafhopper *Ophiola striatula* Fall. and blueberry insects (the cranberry fruitworm, cherry fruitworm, and Putnam's scale); mosquito investigations and control; climate and insect investigations; orchard insect investigations and study of the biological control of the codling moth; insecticidal investigations; vegetable insect investigations (the corn earworm, European corn borer, parsley stalk weevil, pea aphid, and mushroom insects); investigations of soil-infesting insects, bees, and insects injurious to ornamental plants (the greenhouse red spider, the hawthorn and cherry leaf-miner *Profenusa collaris*, the rhododendron midge *Giardomyia rhododendri*, and the cyclamen mite); miscellaneous investigations, including the discovery of a new insect pest of tobacco, *Aglossa cuprealis*, and control of the German cockroach and the common termite *Reticulitermes flavipes* (E. S. R., 82, p. 357); control of the raspberry crown borer; and diseases of the Japanese beetle.

**[Work in entomology by the Puerto Rico College Station]** (*Puerto Rico Col. Sta. Rpt. 1939, pp. 46–52, 73–75, 98, fig. 1*).—The work of the year (E. S. R., 81, p. 541) reported upon includes control of the sugarcane borer through release of artificially reared native egg parasites (*Trichogramma minutum* Riley) and the establishment in Puerto Rico of *Larra americana* Sauss., a specific parasite of the changa, both by G. N. Wolcott and L. F. Martorell; studies on poison bait for the control of the "hormiguilla" *Myrmelachista ramulorum* Wheeler in coffee groves and a study of the dry-wood termite *Cryptotermes brevis* Walker, both by Wolcott; maintenance of a supply of the vedalia, a specific predator on the cottony-cushion scale, by Wolcott and F. Séin, Jr.; a study of the coffee leaf-miner *Leucoptera coffeella* Guer., observations on other insects in coffee groves, and the guamá leaf-miner, all by Séin; the pink bollworm, by J. P. Rodriguez; and attack by the aphid *Cerataphis lantaniae* Boisd. on spadices and flower buds of yellow dwarf coconut.

**Connecticut State entomologist, thirty-ninth report, 1939,** R. B. FRIEND. (Partly coop. U. S. D. A.). (*Connecticut [New Haven] Sta. Bul. 434 (1940), pp. 211–322, figs. 8*).—The report opens with a biographical sketch of the life work of the late W. E. Britton, member of the staff of the experiment station since 1894 and State Entomologist from 1901 to the time of his death, February 15, 1939, by Friend (pp. 215–221), followed by an account of the insect record for the year (pp. 223–225), a brief reference to and program of the annual conference of the Connecticut entomologists held in October (pp. 225, 226) (E. S. R., 82, p. 216), and reports on inspection of nurseries, by M. P. Zappe (pp. 227–236) and of apiaries, by Friend (pp. 237–239), control of the gypsy moth, by J. T. Ashworth and O. B. Cooke (pp. 239–247), the Japanese beetle, by J. P. Johnson (pp. 248–250), mosquito control, by R. C. Botsford (pp. 251–254), rodent control, by H. A. Merrill (pp. 254–258), and parasite work, by P. Garman, J. C. Schread, W. T. Brigham, and G. R. Smith (pp. 258–260).

Accounts are given of tests of apple sprays (pp. 260–264) and further observations of the effect of salt water spray on foliage (pp. 287–293), both

by Zappe and E. M. Stoddard; continued experiments on control of the apple maggot, by Garman and J. F. Townsend (pp. 264–269); continued study of stickers for standard spray mixtures, by Garman and C. E. Shepard (pp. 269–272); experiments with manganese sulfate as safener for lime-sulfur-lead arsenate spray mixtures, by Garman (pp. 272, 273); corn borer insecticide investigations (pp. 273–275) and biology and control of the potato flea beetle (pp. 277–283), both by N. Turner; effect of corn borers on potato yield (pp. 275, 276), survey of wireworm injury to potatoes (pp. 283, 284), and control of squash insects (pp. 285–287), all by R. L. Beard; and the smaller European elm bark beetle, by P. Wallace (pp. 293–311).

The report concludes with miscellaneous insect notes (pp. 311–318) dealing with the crazy ant *Paratrechina longicornis* Latr., dermestid larvae in composition board, the house cricket, Asiatic garden beetle damage in a field of sweet corn, results of trapping rose chafers, the European earwig, bark beetle damage to plantation pine, clover mite in dwellings, and *Calomycterus setarius* Roelofs in Connecticut.

**Effect of fruit growth and weather on deposits of insecticides on apples in southern Indiana,** J. E. Fahey and H. W. Rusk. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 505–511, figs. 4*).—Investigations carried on in southern Indiana during the period 1935–38 to determine the effect of fruit growth and weathering on spray residue deposits on apples are reported. The insecticide studies were conducted in a block of Grimes trees in 1935 and 1938 and in a block of Jonathan trees in 1936 and 1937. "Fixed nicotine was found to be less susceptible to weathering than phenothiazine, and lead arsenate was the least susceptible of the three insecticides. Fruit sprayed with lead arsenate retained at harvest from 51.5 to 76.1 percent of the total residue deposited during the season. Fruit sprayed with fixed nicotine retained from 8.4 to 32.6 percent of the total residue, depending on the interval between the final cover spray and harvest and on the rainfall."

**Summer months draw attention to cotton insects,** C. Lyle (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 6, pp. 1, 2*).

**Recent changes in agriculture and their effect on insect problems,** P. N. Annand. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 493–498*).

**Evaluation of insect damage under the crop insurance plan,** W. P. Flint (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 499–501*).

**[Notes on economic insects and their control]** (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 578–585*).—The contributions presented (E. S. R., 83, p. 363) are: Mosquito Collections at Charleston, South Carolina, Using the New Jersey Light Trap, by F. W. Fisk and J. H. Le Van (pp. 578, 579); Tartar Emetic Sprays Against [the Common] Red Spider, by C. A. Weigel and G. V. Johnson (pp. 579, 580) (U. S. D. A.); Inheritance of Resistance to Hessian Fly, by W. B. Noble, W. B. Cartwright, and C. A. Suneson (pp. 580, 581) (U. S. D. A. and Univ. Calif.); Destruction of an Experimental Population of Bean Weevil by *Pediculoides ventricosus* Newport, by R. J. Bushnell (pp. 581, 582) (Univ. Conn.); Minimum Size of Openings Through Which Clothes Moth Larvae Can Pass, by W. Colman (p. 582), (U. S. D. A.); The Golden Codling Moth [*Carpocapsa pomonella* (L.) *simpsonii* Busck.]—A Second Note, by E. O. Essig (p. 582) (Univ. Calif.) (E. S. R., 82, p. 646); Effect of Lime Sulfur and of Oil Sprays on Treehopper Eggs and Emergence, by M. A. Yothers (p. 583) (U. S. D. A.); Food Habits of Sparrow Hawks in Utah, by G. F. Knowlton and F. C. Harmston (p. 583) (Utah Expt. Sta.): Leafhopper [*Kolla fasciata* Walk.] Reaction to Lawn Sprinkling, by G. N. Wolcott and L. F. Martorell (p. 584) (P. R. Col. Sta.); and Dichloroethyl Ether in Mineral Oil for Corn Earworm Control in Sweet

Corn, by B. B. Pepper and G. W. Barber (pp. 584, 585) (N. J. Stas. and U. S. D. A.).

**Toxicity of nicotine administered internally to several species of insects,** R. Hansberry, W. E. Middlekauff, and L. B. Norton. (Cornell Univ. and N. Y. State Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 511–517*).—In the toxicity studies reported nicotine was administered in measured doses in two ways: (1) By feeding leaf sandwiches containing known amounts of nicotine and measuring the areas eaten and (2) by injection of the nicotine directly into the blood or gut with a microsyringe. "Larvae which were not susceptible to nicotine were *Malacosoma americana* (F.), *Hyphantria cunea* (Drury), *Lycophotia margaritosa saucia* Hbn., *Mamestra picta* Harr., *Estigmene acraea* (Drury), *Halisidota caryae* (Harr.), *Carpocapsa pomonella* L., *Protoparce sexta* (Johan.), *P. quinquemaculata* (Haw.), *Cacoecia cerasivorana* (Fitch), *Ascia rapae* (L.), *Datana integerrima* G. & R., and larvae and adults of *Leptinotarsa decemlineata* (Say). Contrasted to these resistant species which survived doses ranging from 0.04 to 9.8 mg. nicotine per gram of body weight, *Bombyx mori* L. larvae survived no doses of nicotine above 0.017 mg./gm. A compound of Reinecke's salt with nicotine was highly toxic to adults of the Colorado potato beetle and to larvae of the silkworm, moderately toxic to larvae of the tobacco worm, but not appreciably toxic to larvae of imported cabbageworm, hickory tussock moth, ugly-nest caterpillar, walnut caterpillar or to larvae of the Colorado potato beetle. *Euchaetias egle* (Drury), *Nymphalis antiopa* L., *C. cerasivorana*, and *H. caryae* were repelled by nicotine in both soluble and insoluble forms. The first two species would not eat measurable doses, the ugly-nest caterpillar ate small amounts which, although they affected the larvae rapidly, were regurgitated before death occurred, and the hickory tussock moth larvae were not affected visibly by the small doses taken.

"There seemed no highly significant difference in toxicity between the soluble and insoluble forms of nicotine or between ingested and injected nicotine. Third instar larvae of the walnut caterpillar were moderately susceptible to nicotine poisoning, whereas fifth instar larvae of the same species were not."

A list is given of 21 references to the literature.

**Replacing cresylic acid with tar oil in the delayed dormant spray on apple trees,** J. M. Ginsburg. (N. J. Expt. Stas.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 440–443*).—The fact that many orchardists have found it convenient or necessary due to unfavorable weather to start orchard spraying at the delayed dormant period (with 3 percent petroleum oil and 0.5 percent cresylic acid) in combating the apple aphids (the apple grain aphid, apple aphid, and rosy apple aphid) and the European red mite, notwithstanding that the author and his associate (E. S. R., 79, p. 651) have definitely shown the superiority of a dormant spray (3 percent petroleum oil and 2.5 percent tar oil), led to the investigation here reported. The work was devoted largely to the determination of the minimum concentration of tar oil required to kill eggs of apple aphids in the delayed dormant stage in place of 0.5 percent cresylic acid. It was found that "the addition of 0.66 percent tar oil gave as good control of all species of apple aphids as did the addition of 0.5 percent cresylic acid with no greater injury to the buds. Eggs of rosy [apple] aphids were more resistant to control by delayed dormant sprays than by dormant sprays. Delayed dormant sprays containing 1 percent or more tar oil retarded the development of fruit buds in general and severely injured many lateral buds. The addition of tar oil at the delayed dormant stage did not interfere with the efficiency of petroleum oil in control of European red mite."

**Fumigation of sacked grain with chloropicrin,** K. L. Knight. (Univ. Ill.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 536–539*).—Need for an efficient method

of treating insect-infested grain stored in various types of bags, of special importance to commercial seedsmen, led to the fumigation control work with chloropicrin here reported. Two methods of application were employed, namely, injection of the fumigant into the sack and the release of the fumigant into a vault holding the sacks. Mixed cultures of coleopterous stored grain insects were used, including the red flour beetle, the lesser grain borer *Rhizopertha dominica* F., the rice weevil, the granary weevil, and the flat grain beetle, the red flour beetle, in all its stages, being the most resistant to chloropicrin fumigation. The dosages found necessary for 100-percent mortality of all stages of the red flour beetle have shown that the tight bags are best fumigated by the injection method and the porous bags are most efficiently treated by the vault method. With either type of fumigation considerable post-fumigation mortality resulted when the grain could be left undisturbed in the sack for a period of at least 7 days. Each of the two methods of fumigation was found to have certain advantages not possessed by the other. It is believed that supplementing one method by the other will adequately care for any situation where it may be necessary to treat for the control of insects infesting sacked grain. There is need for more comprehensive work on the effect of chloropicrin upon the germination of seeds fumigated by the two methods. However, the viability of the seeds of corn, oats, wheat, and soybeans (with moisture content low enough for safe storage) was not significantly decreased by chloropicrin fumigation with dosages necessary for complete insect control in sacked grain.

**Introduction of selenium into plant tissues as a toxicant for insects and mites,** C. R. NEISWANDER and V. H. MORRIS. (Ohio Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 517–525, figs. 7*).—In studies made of the effect upon insects and mites of selenium introduced into the plant tissues use was made of the common red spider on tomatoes, stocks, roses, and carnations grown in nutrient solution and on carnations grown in selenized soil and of the chrysanthemum aphid on chrysanthemums grown in nutrient solutions. Following a presentation of the methods and materials employed, the details are reported in seven tables. It was found that when the selenium concentration of foliage approached from 90 to 100 p. p. m. the common red spider population was practically eliminated. In the one experiment conducted with the chrysanthemum aphid similar results were obtained with a selenium content of 45 p. p. m. Even with half these quantities of selenium in the leaf tissues significant reductions of both mites and insects resulted. Since the experiments were conducted on artificially infested plants, it is thought probable that under natural conditions still smaller amounts of selenium might prevent destructive populations from developing. In the experiments in which the pests were not eliminated comparatively small quantities of selenium were found in the foliage of the host plants. "Experimental results have demonstrated that selenium can be used effectively against some organisms. If by its use an animal as resistant to insecticides as is the [common] red spider can be controlled, it would seem that economic entomologists might well afford to give the matter of its further development serious consideration. The method offers a new approach in pest control, particularly with plants which are grown for ornamental purposes." It is pointed out that because of the known toxicity of selenium to higher animals, the question as to whether it can be handled safely by commercial growers of ornamental plants should be given due consideration.

**Cotton insect investigations.** (Coop. U. S. D. A.). (*Georgia Coastal Plain Sta. Bul. 30 (1939), pp. 76–78, fig. 1*).—The progress (E. S. R., 81, p. 398) of control work with the bollweevil on upland and sea-island cotton is briefly reported.

**Grasshoppers, a factor in soil erosion in Michigan,** C. B. DIBBLE. (Mich. State Col.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 498, 499*).

**The effect of arsenical grasshopper poisons upon pheasants,** J. H. Lilly. (Wis. Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 501-505, fig. 1*).—In work aimed at the determination of the effect of grasshopper control practices on the ring-necked pheasant it was found that in nature young pheasants are apparently not menaced directly by arsenical baits as they are commonly recommended and used. "Not only are the baits spread too thinly to make them readily available but even the better ones are decidedly unpalatable to the birds. Caged pheasants consumed grasshoppers dead and dying as a result of eating arsenical baits almost as readily as they did unpoisoned grasshoppers, and there are no indications that they will not do so in nature. A young pheasant that had eaten comparatively large quantities of the U. S. D[epartment of] A[griculture] standard bait and another one fed exclusively on poisoned grasshoppers for a period of 12 days showed no gross pathological symptoms when autopsied. and neither of them retained significant quantities of arsenic in the body tissues subsequently analyzed. The results presented here indicate that grasshopper poisoning campaigns are not an important menace to young ringneck pheasant or to individuals who may eventually consume birds so exposed."

**Field control of the gladiolus thrips,** G. V. Johnson and F. F. Smith. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 490-493*).—Control work with the gladiolus thrips indicates "that the quantities of tartar emetic and brown sugar previously recommended [E. S. R., 72, p. 223] may be reduced considerably without reducing the efficiency of the spray. Both U. S. P. and technical grades of tartar emetic were satisfactory, with a price differential in favor of the latter. A calcium antimony tartrate spray gave results comparable with those for a tartar emetic spray of equal antimony content and was appreciably cheaper. Tartar emetic in combination with powdered karaya or sodium oleyl sulfate plus synthetic resins was unsatisfactory. Nicotine sulfate plus karaya was also unsatisfactory. Derris powder in combination with peanut oil and either sodium oleyl sulfate or varnish in combination with sodium lauryl sulfate gave poor control. The spray containing peanut oil retarded the growth and flowering of the gladiolus plant."

**The black hunter, Leptothrips mali (Fitch),** S. F. Bailey. (Univ. Calif.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 539-544, fig. 1*).—This contribution on one of the most common and widely distributed predaceous thrips in North America, presented as a companion paper to that on *Scolothrips sexmaculatus* (Perg.) (E. S. R., 81, p. 245), brings together the known facts concerning *L. mali* as a contribution to the knowledge of beneficial insects. There are 34 references.

**Control of the squash bug by calcium cyanide,** D. Isely. (Univ. Ark.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 475-477*).—Calcium cyanide dust having burned squash foliage, the flakes were tested experimentally in 1939. Applications of the flakes made from June 27 to August 2 under a canvas cover, dragged over two rows of vines as the insecticide was applied, gave an average kill of 98.3 percent when 1 oz. of flakes and water was applied to each hill and held for 5 min. If water was not used, an exposure of 10 min. was necessary to secure satisfactory results. "When the same dosage and exposure was used on a large section, 91.1 percent of the bugs were killed. The bugs which escaped were usually found hanging on the canvas. Exposures of 3 and 4 min. were tried, but in both instances the percentage of bugs apparently killed was less than 80, and some of these were only stupefied. The short exposures which were effective in 1938 when only hills were treated were not satisfactory when entire rows were involved. When 0.5 oz. of cyanide was used at a 10-min. exposure, 56 percent of the bugs were killed. The percentage of mortality at shorter exposures was still less satisfactory. The practical utility of cyanide in the control of the squash bug was not given adequate trial. The high cost may pre-

vent its use. Since cyanide has no apparent effect on squash bug eggs, a second application after the eggs have hatched will be necessary in heavily infested fields. It cannot be expected that a part of the cost can be charged to the incidental control of other pests. . . . In the control of the squash bug, fumigation under canvas has an advantage over the use of contact insecticides in that it is not necessary to hit the bugs and consequently a much more satisfactory kill can be secured. The nearly complete kill of the bugs reduces the required number of applications. . . . The dosage required will doubtless vary depending upon the size of the plants and the temperature and moisture at the time the application is made. Probably a dosage of 1 oz. to a hill will be the maximum required."

**How to stop chinch bug losses**, W. P. Flint, G. H. Dungan, and J. H. Bigger. (Coop. U. S. D. A.). (*Illinois Sta. Cir. 505 (1940), pp. 16, figs. 6*).—This practical account which replaces Circular 431 (E. S. R., 73, p. 209) gives complete directions for combating the chinch bug. It is pointed out that the cheapest and most effective method of fighting this pest consists in the use of chinch-bug-proof crops.

**Certain host plants of the cotton flea hopper**, R. K. Fletcher. (Tex. Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 456–459*).—The studies reported have shown great variations in the abundance of the cotton flea hopper due to variations in its preferred host plants of the genus *Croton*. The studies revealed the part played by *Oenothera laciniata* in the development of an early spring generation of flea hoppers and the importance of *O. speciosa* and the monardas in increasing the flea hopper populations. The effect of agricultural practices on the number and average height of plants of *C. capitatus*, its preferred host, per acre in 10 different fields at College Station, Tex., from 1934 to 1939, inclusive, is shown in an accompanying table.

**Technique in control experiments with apple aphids**, C. R. Cutright. (Ohio Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 443–445, figs. 2*).—An account is given of the technic employed in ovicidal tests and in testing materials against active aphids.

**Rate of reproduction of the pea aphid on different alfalfa plants**, R. G. Dahms and R. H. Painter. (Kans. Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 482–485, fig. 1*).—Studies conducted at Manhattan, Kans., in 1935, the details of which are given in tables, have shown the optimum temperature for pea aphid reproduction and life to be several degrees higher on alfalfa plants that appear to be susceptible under field conditions than on plants that appear to be resistant. "The pea aphid reproduced more rapidly and the mortality was less on alfalfa plants that appeared to be susceptible under field conditions than on those that appeared to be resistant. Aphids reproduced more rapidly on selfed progeny of susceptible selections than on the selfed progeny of resistant selections, but the progenies varied considerably in this respect. Some alfalfa plants which appeared to be resistant in the field furnished satisfactory food for aphid reproduction. These plants may be resistant because of their ability to withstand the feeding of aphids. When aphids were confined to flowering and vegetative branches of the same plant, they reproduced much faster on the flowering branches. Although in this summary of the experiments, plants have been classed as resistant or susceptible, there was considerable range in mortality and rate of reproduction within the two groups."

**Pea aphid control in Maryland during 1939**, L. P. Ditman, C. Graham, and E. N. Cory. (Md. Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 477–481*).—The details of a study of pea aphid control on Alaska peas in Maryland, which consisted of a replicate plat experiment and a set of control demonstration plats, both located on the Eastern Shore at Ridgely, are reported in seven

tables. "From observations of the results of sweep records . . . and from a statistical analysis of the results, derris appears to be superior to ordinary cubé in effectiveness against the pea aphid. Good kill obtained with micronized cubé indicates that fine grinding may increase the toxicity. Dusts appear to be slightly better than sprays under the conditions of application on these plats. Dusts applied at high humidity when dew was on the plants gave slightly better results than dusts applied later in the day when temperature was higher, humidity lower, and plants dry. At 300 lb. pressure, Agicide nozzles give a better coverage than the ordinary type of spray nozzles. At 600 lb. pressure, the ordinary nozzles gave as good results as the Agicide nozzles, even though only one-half as many of the ordinary nozzles were used on a boom of the same length."

**Comstock's mealybug on apple and catalpa,** J. A. Cox. (Va. Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 445–447*).—This is a brief summary of information on *Pseudococcus comstocki* Kuw., now a pest in many orchards in some of the principal apple-growing regions of Virginia, as reported by Woodside (E. S. R., 75, p. 665) and by Schoene (E. S. R., 83, p. 221), and also of catalpa in the State, as reported upon by Hough (E. S. R., 53, p. 756). The parasites reared from this mealybug in 1939 are *Clausenia purpurea* Ishii, *Thysanus nigra* Ashm., *T. elongatus* Gir., *Pachyneuron altiscuta* How., and *Lygocerus* sp., of which the first mentioned is the most important.

**Winter mortality of the black scale (Saissetia oleae Bern.) on oranges in California,** R. H. Smith. (Univ. Calif.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 534, 535*).—The author found winter mortality to be an important factor that has apparently been overlooked in the control of this pest. The success or failure of a treatment, as judged by the degree of infestation in spring and early summer of the following year, depends to a large extent upon the number of insects that die of natural causes subsequent to the treatment. The work reported includes the results of (1) mortality studies based on black scale counts on every tree in two 10-acre orange groves and showing the number of live black scale per "unit" at intervals from the time of spraying, August 27, 1935, to June 10, 1936, and (2) mortality studies on black scale on two orange trees, counts of which were made, one each per month, in October, January, March, and June.

**Commercial control of cabbage caterpillars near Charleston, S. C.,** C. O. Bare. (U. S. D. A. and S. C. Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 463–467*).—Report is made of a study from 1935 to 1938 of the insecticidal methods of control employed by different commercial growers in fields near Charleston and their effectiveness.

**The value to uninfested States of gypsy moth control and extermination,** A. F. Burgess. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 558–561*).

**The spruce budworm in Minnesota,** S. A. Graham and L. W. Orr (*Minnesota Sta. Tech. Bul. 142 (1940), pp. 27, figs. 6*).—A report is made of work with the spruce budworm, which has been responsible for the most disastrous forest losses due to insect attack. The favorite host is balsam fir. This native budworm is always present in the northern coniferous forests and at times increases tremendously and an outbreak results. Following a brief discussion of the damage caused by the pest and its life history and habits, the effect of an outbreak on various host species, the course of an outbreak, effects of defoliation, tree reproduction following budworm outbreak, the increased fire hazard, causes of a budworm outbreak, and control of the pest are considered. In dealing with its control the authors consider forest types in which balsam fir does not occur at present, forest types containing balsam fir, combinations

of spruce and fir, pure stands of balsam fir, and reduction of budworm hazard by logging operations.

**Biological control of the codling moth and the oriental fruit moth,** J. E. WEBB, JR., and C. H. ALDEN (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 431–435, figs. 2*).—Report is made of parasite control work conducted during a 10-yr. period, commencing in 1930, in a laboratory of the Georgia Department of Entomology. The greater portion of the time and effort was devoted to mass production of and experimental work with the egg parasite *Trichogramma minutum* Ril. as a supplemental control for these two pests. More than 300 million egg parasites were colonized in commercial peach and apple orchards during this period and over a million and a half laboratory host eggs (angoumois grain moth) were produced in a single day with the wheat cabinets here described and illustrated. "Of 37,057 codling moth eggs collected, 56.2 percent were parasitized, and of 2,101 [oriental] fruit moth eggs collected, 36.3 percent were parasitized by *T. minutum*. About 40,000 *Macrocentrus ancylivorus* [Roh.] have been colonized in commercial peach orchards for [oriental] fruit moth control. Of 3,450 [oriental] fruit moth-infested twigs collected in these colonized orchards, 1,340 total emergences were obtained with an average of 29.6-percent parasitism, mostly *M. ancylivorus*. Of 2,593 total emergences from codling moth larvae, 19.1 percent were parasites, mostly *Ascogaster carpocapsae* [Vier.]. It is estimated that the egg and larval parasites of the [oriental] fruit moth destroy 55.2 percent of its total population and those parasitizing the eggs and larvae of the codling moth destroy 64.6 percent of its population. The scoring of 2,000 harvested fruits each year, from 1932 to 1939, inclusive, in an experimental Elberta peach orchard where both *T. minutum* and *M. ancylivorus* have been colonized, shows an almost continuous decline of [oriental] fruit moth infestation."

Other data included are: Combating *Habrocytus cerealellae* Ashm. and other pests of the grain moth breeding rooms; the production, colonization, and method of handling *Macrocentrus;* and a new ice box for transporting live insect material.

In the parasite production two grain moth breeding rooms each 15 by 15 by 7.5 ft. were made use of, each being equipped with seven breeding cabinets that hold about 1.5 bu. of wheat per cabinet. The cabinets measured 27.5 by 29.5 by 21.5 in., outside dimensions, with 14-in. legs and four trap cans in the upper corners. The account includes a description of the technic employed.

**Codling moth flight habits and their influence on results of experiments,** L. F. STEINER. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 436–440*).—In a study of the flight habits of the codling moth, releases of marked moths made during the years 1934–38 both outside and inside of baited areas in southern Indiana and their subsequent recapture in traps or in dusted unbaited trees proved conclusively that extensive intertree and interplat movement of moths is normal and common. "The average distance traveled away from their points of release was approximately 200 ft. in baited areas, where the distance to the outer rows of traps and the stoppage of flight by capture placed a limit on the length of normal flights. Normal movement of 200 ft. would be equivalent to a mass migration of all moths from the center to the outside of a 3-acre plat. Individual flights of more than 2,000 ft. were recorded, proving the ability of the insect, if emerging within a 100-acre orchard, to travel to any part of it. The replication of spray treatments, regardless of whether single-tree or 10-tree replicates are used, will not eliminate the influence of migration. Spray treatments with nicotine bentonite which are highly effective in the first brood but which may weaken shortly before harvest (unless additional sprays are applied) have given control superior to that obtained with

lead arsenate when tested on a large enough area so that their effects on the first brood would not be lost, but when tested in small replicated plats the early survivors in the plats sprayed with lead arsenate later provided a population which reinfested the nicotine-treated plats late in the season. Consequently small-plat tests in a two-brood or three-brood area will often show the relative effectiveness of the treatments against only the latest brood, if reliance is placed solely on records from drop and harvest fruit.

"Late-season moth migration proved capable of obscuring a large part of the effectiveness of orchard sanitation and banding or of the use of bait traps in tests involving 20-acre and 12-acre plats, respectively. The control obtained after the end of the first-brood period was more than offset by the more rapid build-up of the population in the treated areas late in the season, largely as a result of moth movement.

"The evidence suggests that there is a normal leveling off of the population between areas of heavy and of lower density, with movement occurring in both directions proportional to the population. There is also evidence that some moths make long flights and that under favorable conditions some of the population may extend its normal movement to considerable distances, giving the effect of a mass migration."

**Substitute spray material, II,** C. G. VINSON and S. A. MCCRORY (*Missouri Sta. Res. Bul. 316 (1940), pp. 14*).—Results of further experiments (E. S. R., 80, p. 224) with nicotine-bentonite combination cover sprays are said to be in harmony with previous findings, such sprays, beginning after the calyx spray with lead arsenate, having been as fully effective as lead arsenate in controlling codling moth and producing clean fruit. "The percentage of stings in 1939 on fruit from plats sprayed with nicotine-bentonite combinations was very greatly reduced under the number of stings on fruit from the plat sprayed with lead arsenate. The addition of a spreader and sticker such as summer oil, whole-milk powder, and Vatsol O. T. increased the effectiveness of the nicotine-bentonite combinations. The addition of Floor Seal did not make for increased effectiveness of the spray, although it did increase the deposit and retention of nicotine on the fruit and foliage. The dry-mix method of preparing nicotine-bentonite preparations produced a product which gave no obvious and objectionable residue on the fruit."

**The corn ear worm and its control,** L. A. CARRUTH (*New York State Sta. Cir. 190 (1940), pp. 14, figs. 8*).—Means of control of the corn earworm on Long Island, where it is most destructive, and in other parts of the State are described.

**A method for production of cutworms in greenhouses,** W. D. WYLIE and C. E. PALM. (Cornell Univ.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 462, 463*).—A method devised for rearing cutworms in sufficiently large numbers and of satisfactory uniformity for laboratory toxicological studies is described.

**Studies of mosquito repellents.—I, Test procedure and method of evaluating test data. II, Relative performance of certain chemicals and commercially available mixtures as mosquito repellents,** P. GRANETT. (Rutgers Univ.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 563–565, figs. 2; pp. 566–572*).—In the first part of this report a description is given of a method of testing mosquito repellents in the field comparable to the normal use of such materials. In the second part the relative effectiveness of various repellent substances and various proprietary repellents tested in the field against mosquitoes, principally the salt-marsh mosquito and the brown salt-marsh mosquito, and the composition of certain proprietaries are reported upon, the details being given in tables.

**Spray residue and substitutes for lead arsenate in control of cherry fruitflies,** D. W. HAMILTON. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 447–451, figs. 2*).—In control work with the cherry fruitfly and the black

cherry fruitfly lead arsenate was used effectively, but the residues at harvest were above the minimum tolerance. When used at the rate of 2.5 lb. per 100 gal. of spray at shuck fall, use of arsenicals in the maggot sprays will create excessive residues. Where danger of arsenical injury prevents use of more than 1 lb. of lead arsenate per 100 gal. at shuck fall, a pound of basic zinc arsenate may be applied in the first maggot spray. In field tests with both cubé root and phenothiazine as substitutes for arsenicals, heavy populations of fruitflies were satisfactorily reduced when at least three applications were made at the rate of 2 lb. per 100 gal. of spray. In one test a 15-percent phenothiazine dust appeared nearly as effective as these sprays. Basic zinc arsenate only partially controlled cherry fruitflies when two light applications were made.

**The life history of Phyllophaga lanceolata (Say) and Phyllophaga crinita Burmeister,** H. J. Reinhard. (Tex. Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 572–578*).—This is the first in a series of papers based upon life history studies of species of *Phyllophaga* commenced as a project at the station in 1937. The details are presented in eight tables. The work has shown the complete life cycle of *P. crinita* to be as follows: "The beetles begin to emerge in May and are commonly active throughout June. Earliest oviposition in the laboratory was noted on May 25 and the last on July 13. About 13 days are required for the eggs to hatch. The larvae continue to feed for 2 or 3 mo. and attain full growth during September or October, after which they remain quiescent throughout the winter season. Pupation begins about mid-April and pupae occur commonly in May. Approximately 20 days are required for the pupal stage, from which the beetles begin to emerge in May to complete a 1-yr. life cycle. Under favorable rearing conditions the average duration of the developmental stages was determined as follows: Egg 13 days, larva 281 days, and pupa 20 days. These periods total 314 days as compared with 365 days for *P. lanceolata*."

**Feeding habits of the adult Japanese beetle,** I. M. Hawley and F. W. Metzger (*U. S. Dept. Agr. Cir. 547 (1940), pp. 31, figs. 11*).—Studies of the feeding habits of the adult Japanese beetle, which attacks various plants by eating the leaf tissue between the veins, giving the leaf a skeletonized or lacelike appearance, are reported. The beetles feed most actively between 9 a. m. and 3 p. m. on sunny days. Feeding is light below 70° and above 95° F. and when the relative humidity is below 60 percent. There is a seasonal variation in the choice of food plants, early feeding being on low-growing vegetation, later feeding on the taller trees favored for food, and toward the close of the season the beetles again preferring the lower plants, especially roses, weeds, and plants putting out new foliage. Two hundred and seventy-seven plants are listed as fed upon by the beetles. Of these, 43 species are severely attacked, 58 moderately attacked, 67 fed upon generally but lightly, and 109 occasionally and lightly attacked. In addition to these lists there is a list of 89 plants that are not known to be attacked under any condition. There is a complete index of the plants by common and scientific names.

**Methyl bromide fumigation for control of Asiatic beetle grubs attacking azalea plants,** C. C. Hamilton. (N. J. Expt. Stas.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 486–490*).—Report is made of the results of tests of the killing effect of methyl bromide on the oriental beetle grub attacking the roots and stems of azalea plants. Three methods of applying this insecticide were developed, namely, "(1) fumigation under a box which confines the charge of methyl bromide to a definite area; (2) the dilution of methyl bromide, 1 part in 5 parts of either methyl alcohol or ethyl alcohol, and injecting this mixture into the soil at rates equivalent to 1 and 2 cc. of methyl bromide per square foot; and

(3) the use of methyl bromide, 1 part in 5 parts of either methyl alcohol or ethyl alcohol and diluting this mixture in water and sprinkling it over the soil to be treated for the grubs. . . . Tests conducted to kill the Asiatic [oriental] beetle grubs in fallow soil in the azalea greenhouses showed that satisfactory kill could be obtained with chloropicrin applied 2 cc. per square foot if injected 3 to 4 in. from the surface, with carbon bisulfide at the rate of 0.75 oz. per square foot applied in shallow furrows about 10 in. apart, and with a mixture of methyl bromide and methyl alcohol injected into the soil equal to 1 cc. of methyl bromide per square foot. All three materials are probably equally effective in killing the Asiatic [oriental] beetle grubs. However, the soil cannot be planted until after all the carbon bisulfide or chloropicrin has escaped from the soil, which may be 10 days to 2 weeks for the carbon bisulfide and 2 to 3 weeks for the chloropicrin. Soil treated with the methyl bromide may be planted, without injury to the plants, within 2 to 3 days after treatment."

**Particle size of paris green as related to toxicity and repellency to the Mexican bean beetle,** E. R. McGovran, C. C. Cassil, and E. L. Mayer. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 525–531, figs. 2*).—In the experiments reported paris green particles with an average diameter of 1.1$\mu$ caused higher mortalities of the Mexican bean beetle and permitted less feeding when applied, either as a spray or as a dust, to bean foliage than did particles of 12$\mu$, which were intermediate, and 22$\mu$, which caused the lowest mortality and permitted the greatest amount of feeding.

***Breeding hosts of the tobacco flea beetle,*** C. Levin. (U. S. D. A.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 473–475*).—In studies at Oxford, N. C., of tobacco in plant beds and of potatoes in the field as breeding hosts of the tobacco flea beetle it was found that both crops were breeding hosts of great importance, particularly during the early part of the season. The first generation of beetles began to emerge soon after tobacco was transplanted to the field. The evidence obtained showed that the beetles soon moved from the plant beds because the numbers that emerged in the beds were sufficiently large to have caused severe foliage injury to the plants had the beetles not moved.

**Host plants of the tobacco flea beetle,** E. H. Glass. (Va. Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 467–470, figs. 2*).—Surveys were made and rearing experiments conducted in Pittsylvania County, Va., in 1939 in order to determine the host plants of the adults and the larvae of the tobacco flea beetle and their importance in maintaining or increasing the beetle population in the State. The adult beetles were found in the spring feeding on 13 hosts. During the growing season they occurred principally on tobacco, and in the late summer and early fall 52 host plants were recorded. "The insect was reared on all plants of the family Solanaceae tested but not on 16 species of plants representing 10 other families. The beetles developed most readily on tobacco, potato, and jimson weed. Tobacco plants in the bed and potato in the field were important in building up the beetle population in nearby fields in the spring before the tobacco plants were set in the field."

**Migration of the tobacco flea beetle,** C. B. Dominick. (Va. Expt. Sta.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 470–472, fig. 1*).—Through the use of adhesive screens it was shown that upon emergence from hibernation tobacco flea beetles migrate to the first available host plants. "At the time of the transplanting of tobacco the insects tend to migrate from other host plants to newly set tobacco plants. The largest number of beetles were captured on adhesive screens at a height of 2 to 4 ft. above the ground, although some were caught at an altitude of 22–24 ft. It was demonstrated that the most extensive migration takes place after the tobacco has been harvested."

**The potato flea beetle and the potato psyllid in Nebraska,** M. H. SWENK and H. D. TATE (*Nebraska Sta. Bul. 327* (*1940*), *pp. 19, figs. 6*).—The two insects of greatest importance in the profitable production of potatoes in Nebraska are dealt with, namely, the potato flea beetle (pp. 3–9), and the potato psyllid responsible for the psyllid yellows disease (pp. 9–17).

**Notes on Oncideres twig girdlers,** E. G. LINSLEY. (Univ. Calif.). (*Jour. Econ. Ent., 33* (*1940*), *No. 3, pp. 561–563*).—Notes are given on the more important economic species of tree girdlers in the United States, including the huisache girdler *O. pustulata* Lec., the twig girdler *O. cingulata* (Say), the Texas twig girdler *O. texana* Horn, the Arizona oak girdler *O. quercus* Skinner, and the mesquite girdler *O. rhodosticta* Bates.

**Some factors in natural control of the southern pine beetle (Dendroctonus frontalis Zimm.),** L. A. HETRICK. (Va. Expt. Sta.). (*Jour. Econ. Ent., 33* (*1940*), *No. 3, pp. 554–556*).—A brief report is made of the results of a study of the high mortality of the southern pine beetle in eastern Virginia in 1939. "Two species of nematodes were found infesting living and dead bark beetles of all stages. Five species of mites were found on the bodies of adult beetles in the insectary. Insect parasitism was negligible for the overwintering brood but amounted to 10 percent for the first brood."

**[Smaller] European elm bark beetle and Dutch elm disease control,** E. P. FELT (*Jour. Econ. Ent., 33* (*1940*), *No. 3, pp. 556–558*).

**Control of plum curculio on peach in Illinois,** S. C. CHANDLER (*Jour. Econ. Ent., 33* (*1940*), *No. 3, pp. 451–453, fig. 1*).—In the experiments reported lead arsenate applied to peach in the form of oil dust produced much less injury than when applied as a liquid spray, although excessive numbers of dust applications (five or more) may cause serious injury. "Eight seasons' tests with oil dust containing 10 percent lead arsenate and 5 percent oil show practically no difference in control of plum curculio from lead arsenate sprays used at 3 lb. to 100 gal. Cryolite is an unreliable and sometimes dangerous substitute for lead arsenate for control of plum curculio on peach. Jarring shows considerably more curculios at the edge of a peach orchard than are present even a few rows in from the edge. The best procedure from the standpoint of economy, efficiency, and safety to fruit and foliage is to use a minimum number of oil dust applications over the entire orchard with others at the edges or where jarring indicates abundance, and orchard tests show this procedure to be practical."

**Further studies of the plum curculio in the Georgia peach belt,** O. I. SNAPP. (U. S. D. A.). (*Jour. Econ. Ent., 33* (*1940*), *No. 3, pp. 453–456*).—The results of further studies (E. S. R., 64, p. 58) of the life history and habits of the plum curculio in the Georgia peach belt, conducted at Fort Valley during the years 1936–39, are reported. It was found that "approximately one-half to three-fourths of the females of the first generation deposited eggs during the year of emergence. Dissections at the end of each season showed practically no egg development in females that had not oviposited. Following emergence from the soil and appearance from hibernation, about 1 mo. was required for eggs to mature. The movement of first-brood adults following their emergence from the soil was confined mostly to the tree from which they came and to trees nearby. Overwintered adults were found to travel from tree to tree even if there was fruit for food and oviposition, but after they became disseminated throughout the orchard their travel appeared to be confined to but a few adjacent trees. These adults did not seem to travel from an orchard, after the peaches were harvested, to other orchards before entering hibernation. The plum curculio was found to enter hibernation in midsummer within a

month after peach harvest and to hibernate in debris along the edges of woods bordering and near peach orchards. In 5 of the last 7 yr. this insect appeared on peach trees before full bloom and in 6 of these years they were disseminated throughout the orchards by the time three-fourths of the petals had fallen."

**Methyl bromide in aqueous solution to control Pantomorus leucoloma and P. peregrinus,** E. M. LIVINGSTONE, S. S. EASTER, and G. R. SWANK. (U. S. D. A.). (*Jour. Econ. Ent.*, *33* (*1940*), *No. 3*, *pp. 531–533*).—In the work with the white-fringed beetle reported "an aqueous solution containing 0.3 percent of methyl bromide and 0.6 percent of denatured ethyl alcohol was found to be of value in destroying larval infestations of *P. leucoloma* and *P. peregrinus* in burlapped balls of earth such as would be encountered on the roots of nursery stock. Results of a limited number of experiments showed that when infested balls were plunged in sand boxes that were 1 ft. deep, with a 2-in. sand space on all sides of the balls, and the insecticide applied at the rate of 40 gal. per 100 sq. ft. of surface area, complete mortality of larvae of *P. leucoloma* was obtained in balls 6 in. and smaller in diameter with an 18-hr. exposure, and complete mortality of larvae of *P. peregrinus* was obtained with a 4-hr. exposure. This apparent difference in the susceptibility of the larvae of these two species of *Pantomorus* is due to the different types of soil found in the two localities where the experimental work with the fumigant was carried on."

**Soil fumigation for control of the alfalfa snout beetle,** H. H. SCHWARDT and C. G. LINCOLN (*Jour. Econ. Ent.*, *33* (*1940*), *No. 3*, *pp. 460–462*).—This report on soil fumigation control work with the alfalfa snout beetle, which supplements the biological work reported by Palm in 1935 and 1936 (E. S. R., 76, p. 368), was conducted with a view to the development of a system of soil fumigation that would eradicate the beetle from small isolated spots. The beetle, introduced from central Europe some 40 yr. ago, is now present in more than 3,000 acres of alfalfa in Oswego and Jefferson Counties, N. Y., and from time to time isolated spots removed several miles from the continuous area appear. In these spots soil fumigation has been found effective in eradicating both beetles and larvae. "Preliminary tests with carbon bisulfide, chloropicrin, methyl bromide, carbon tetrachloride, dichloroethyl ether, and orthodichlorobenzene indicate that only carbon bisulfide can be depended upon to eradicate both larvae and adults under the various weather and soil conditions encountered in northern New York. Approximately 3,500 lb. of carbon bisulfide per acre injected in holes 15 in. apart and 8 in. deep has given a complete kill in all tests. Eighteen hundred lb. per acre gives a nearly complete kill, and it is believed that a dosage of 2,500 lb. per acre will prove to be completely effective."

**The apparent climatic limitations of the alfalfa weevil in California,** A. E. MICHELBACHER and J. LEIGHLY (*Hilgardia* [*California Sta.*], *13* (*1940*), *No. 3*, *pp. 103–139*, *figs. 11*).—It is apparent from the authors' observations and studies made throughout the world where the alfalfa weevil occurs that high temperature sends the adult weevils into estivation. Because of the failure of the pest to spread readily into the hotter portions of the San Joaquin Valley since its appearance in lowland middle California in 1932, it is the belief that the pest is encountering a climatic barrier. High temperature is said to retard or inhibit the maturing of the sexual organs. "The temperature range favorable for sexual development appears to fall between the limits of 10° and 25° C. Using this temperature range as a basis, the portion or portions of the year favorable to adult weevil activity have been plotted for stations in America and in a part of the Old World where the weevil is known to occur. By so

doing the weevil was found to exist in areas having four distinct types of climate: (1) Type *u* in areas where temperatures favorable to adult activity are present throughout the entire year; (2) type *w* where, owing to cold winters, there is a winter interruption in adult activity; (3) type *s* where, owing to hot summers, there is a summer interruption; and (4) type *ws* where both cold winters and hot summers cause a summer and a winter interruption.

"Areas having a winter interruption (type *w*) are further divided into two subtypes: (1) Those having a short winter interruption and (2) those having a long winter interruption. In climates of the latter type the alfalfa weevil is very destructive. This is the result of the short growing season which brings about a mass attack of the weevil on the alfalfa. Climates of this type are characteristic of the intermountain region of the United States which includes northeastern California. In this subtype the principal adverse factor affecting the weevil is low winter temperature. In climates of the first subtype where the winter interruption is short, adult weevils are active early in the year and before midsummer there is time for one full generation and at least a partial second generation. Alfalfa is seriously attacked only occasionally. This subtype appears in California in the coastal valleys north of southern California, in the lower extremities of the San Joaquin and Sacramento Valleys, and along the coast of the northern half of the State. Areas having both a winter and a summer interruption (type *ws*) are also divided into two subtypes: (1) Those having cold winters and (2) those having relatively mild winters. The first subtype is represented by the continental stations in the Old World where the alfalfa weevil is destructive because of mass feeding by the larvae and the factor that limits the weevil is cold and severe winters. In the second subtype with mild winters the limiting factor is high summer temperatures, as is also the case in the climatic type *s* where there is a summer interruption but no winter interruption."

Basing their view upon the reported distribution of the alfalfa weevil in the hotter portions of its range in the Old World the authors are led to conclude that the pest can adapt itself to almost all climates of California. "Certainly the climates of the hot California deserts would appear to be favorable, but we hardly think that this is the case, for evidence is presented that would tend to indicate that a second species closely related to the alfalfa weevil is involved. The species *Hypera brunneipennis* was recently found [E. S. R., 83, p. 93] in the neighborhood of Yuma, Ariz., and adjacent part of California. Very likely this species, which is adapted to hot climates, has been confused with *H. postica* in the hotter portions of the Old World and has been referred to the latter species. Judging from the behavior of the alfalfa weevil in California and the lack of reported damage in places such as Italy, we are inclined to believe that the pest will not be able to survive in the hotter portions of California."

**Effect of Bathyplectes curculionis on the alfalfa-weevil population in lowland middle California,** A. E. Michelbacher (*Hilgardia* [*California Sta.*], *13* (*1940*), *No. 3*, *pp. 81–99*, *figs. 7*).—The larval parasite *B. curculionis* (Thoms.) of the alfalfa weevil was introduced into Utah from southern Europe during the years 1911 to 1913, and into the lowland infested area of middle California during the seasons of 1933 and 1934 by the U. S. D. A. Bureau of Entomology. It became readily established in California and was recovered at Pleasanton in 1933 and in the San Francisco Bay area in 1934 but was not found in the San Joaquin Valley until 1935, at which time about 30 percent of the large alfalfa weevil larvae were discovered to be parasitized. The progress of its

parasitism was determined by studies conducted in three different climatic areas, namely, the San Francisco Bay and Pleasanton areas and the northwest portion of the San Joaquin Valley, through field collections of last-instar alfalfa weevil larvae and the rearing through of their parasites in the laboratory. "In each field 2 lots of 100 sweepings were made with an insect net, and the average number of larvae and adults collected per 100 sweeps was used as a population index for the alfalfa weevil. The highest alfalfa weevil larval peak generally occurs on the first crop, but it may occur on the second or even later crops. Weevil activity begins early in the growing season, and a second generation generally makes its appearance during the latter part of June and through July.

"*B. curculionis* produces short- and long-cycle forms. Individuals of the latter form are produced at any time during the active period of the parasite. Climate apparently greatly influences the behavior of *Bathyplectes*. Its active period is limited by the hot climate of the San Joaquin Valley. In the cooler portions of the weevil-infested areas of lowland middle California the parasite is able to continue activity throughout the growing season. The most active period ranges from early season until about the first of July. For summer and fall activity to be noticeable two conditions are apparently necessary, namely, a certain host density and a cool climate."

The information gathered concerning parasitism and alfalfa weevil population trends is shown by graphs for the different regions studied. These graphs indicate that the San Joaquin Valley is less suited to *Bathyplectes* than the cooler areas. Definite predictions concerning the final effect of *Bathyplectes* upon the alfalfa weevil population cannot be made as yet, but in 1938 the parasite showed considerable promise. From all indications it will exert a marked controlling influence in the cooler weevil-infested areas.

**Notes on the life history of Baeus californicus Pierce, an egg parasite of the black widow spider,** C. E. PEMBERTON and J. S. ROSA (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 44 (1940), No. 2, pp. 73–80, figs. 4*).—The successful introduction and establishment in Hawaii of the egg parasite of the black widow spider, described by Pierce from California in 1938 as *B. californicus* (E. S. R., 81, p. 253), as a control measure for that spider is reported upon. Its life cycle, determined at the station, averages about 22 days during the warm months of the year and from 25 to 29 days during winter. A spider egg sac collected at Lualualei, Oahu, in December 1939, which had been attacked by parasites previously liberated in that locality, produced 348 parasites and no spiders and is said to be the first record of field work with the parasite in Hawaii.

**The effects of ingestion of black widow spiders with canned food,** W. B. HERMS, B. C. MCIVOR, and C. LADENHEIM. (Univ. Calif.). (*Jour. Econ. Ent., 33 (1940), No. 3, pp. 550–554*).—Tests with white mice, guinea pigs, and a monkey, here described, furnish evidence that ingestion of the venom through consuming the black widow spider *Latrodectus mactans* causes no harm to experimental animals. Numerous tests made with experimental animals by allowing them to feed on canned spinach or drink liquid from canned spinach produced no ill effects which could be recognized by careful observation.

## ANIMAL PRODUCTION

**[Experiments with livestock in Florida],** A. L. SHEALY, W. G. KIRK, R. M. CROWN, R. W. KIDDER, L. O. GRATZ, W. F. WARD, R. B. BECKER, W. M. NEAL, P. T. D. ARNOLD, L. L. RUSOFF, N. R. MEHRHOF, O. W. ANDERSON, JR., E. F. STANTON, and D. F. SOWELL. (Partly coop. U. S. D. A. et al.). (*Florida Sta.*

*Rpt. 1939, pp. 68–71, 73–78, 79, 80, 169, 170, 172, 175–177, 179, 180, 194*).—Brief progress reports (E. S. R., 81, p. 254) are presented for the following lines of investigation: The improvement of beef cattle herds through the continuous use of purebred sires of different breeds on grade cows, and other beef and dual-purpose cattle investigations; mineral deficiencies in feeds used in cattle rations; a comparison of the loss of nutrients in ensiled corn, Napier grass, sugarcane, and sorghum; a comparison of silages for wintering beef calves and yearlings; the value of Napier grass for pasture purposes; the digestibility of fresh Napier grass and of sugarcane silage; the digestibility and feeding value of dried grapefruit and dried orange refuse; the comparative value of sugarcane silage, shocked sugarcane, and pasture, supplemented with cottonseed meal for wintering beef cattle; the value of molasses in steer-fattening rations; the effectiveness of cottonseed meal in preventing a ricketslike nutritional disorder in cattle on pasture; a comparison of ground v. unground mixtures of corn and velvetbeans with and without molasses for fattening steers; a comparison of the progeny performance of native, grade Columbia, and purebred Columbia sheep; deficiencies of peanuts when used as a feed for swine; methods of handling sows and young pigs; a comparison of various grazing crops for fattening feeder pigs; and the utilization of citrus meal as a swine feed.

From poultry investigations results are noted on poultry breeding experiments with reference to egg production, egg size, livability, hatchability, broodiness, and disease resistance; the utilization of citrus byproducts for poultry; the vitamin content of shark-liver oil; and different methods of feeding grain to layers.

**[Investigations with livestock in Georgia].** (Partly coop. U. S. D. A.). (*Georgia Coastal Plain Sta. Bul. 30 (1939), pp. 45–73, figs. 4*).—Progress reports (E. S. R., 81, p. 404) are presented for the following lines of investigation: The value of fertilizing lowland and upland permanent pastures and also the returns secured from various annual summer and winter pastures as measured by grazing tests with steers; ground snapped corn, sorghum silage, cottonseed meal, and oat straw as a winter ration for beef cows; the returns secured from the winter grazing of corn and velvetbeans after corn had been harvested; the profitableness of veal production; feed requirements for wintering feeder calves; the management of brood sows and their litters; the value of various summer crops for spring litters; and the returns secured from hogging off corn, runner peanuts, and sweetpotatoes. An additional year's results of previously described steer-fattening experiments are reported in detail.

**[Livestock investigations in Mississippi]** (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 6, pp. 1, 7, 8*).—The results of experiments with livestock are briefly reported in articles entitled: Corn and Tankage for Finishing Pigs Leads in Another Test, by P. G. Bedenbaugh; Sweetpotatoes Show Merit as Feed for Dairy Cows in Test, by W. C. Cowsert; and Cottonseed Meal and Shrimp Meal Used to Advantage as Protein Sources in Balanced Feed for Broiler Production, by H. D. Polk.

**Commercial feeding stuffs,** L. S. Walker and E. F. Boyce (*Vermont Sta. Bul. 458 (1940), pp. 46*).—The usual report of the analyses for protein, fat, and fiber of 2,093 samples of feeding stuffs collected for official inspection during December 1939 (E. S. R., 82, p. 805).

**[The production and nutritive value of forage plants in Puerto Rico],** F. Méndez, D. H. Cook, J. Axtmayer, G. Rivera, and J. Goyco (*Puerto Rico Col. Sta. Rpt. 1939, pp. 95–98*).—Results are briefly presented on the adaptability of various legumes to Puerto Rico conditions and the digestibility and vitamin content of various native grasses and legumes.

**The conservation of alfalfa, timothy, and soybean nutrients as silages and as hays**, J. A. Newlander, H. B. Ellenberger, O. M. Camburn, and C. H. Jones (*Vermont Sta. Bul. 459 (1940), pp. 42*).—Comparable lots of alfalfa, timothy, and soybeans were ensiled and made into sun-cured and artificially dried hays. The silages were prepared without preservatives and with added preservatives, including molasses, phosphoric acid, and a mixture of sulfuric and hydrochloric acids. The dry matter of the ensiled material ranged from 28 to 45 percent for alfalfa, from 30 to 49 percent for timothy, and from 21 to 33 percent for soybeans. All groups were satisfactorily ensiled without preservatives providing the dry matter content was at an optimum level. The most desirable alfalfa silage was molasses preserved, with 40 percent dry matter and a pH of 4.76. Three lots of timothy silage, one without preservative (dry matter 37 percent, pH 4.94) and two molasses preserved (dry matter 31 and 48 percent, pH 4.58 and 4.79, respectively), were adjudged of equal quality. Acid-preserved samples were also of good quality. Soybeans containing approximately 25 percent dry matter made poor silage either with or without molasses, but soybeans wilted to from 31 to 33 percent dry matter made good silage even without preservative. Soybeans of low dry matter content were well preserved when treated with phosphoric acid. The nutrients in hays and silages were about equally digestible except for ether extract in sun-cured hay which was relatively very low. Losses of nutrients under different methods of storage are indicated. The conservation of nutrients in hay under ideal weather conditions equaled that secured in the best preserved silages.

**Abstracts of papers, 98th meeting, American Chemical Society** (*Amer. Chem. Soc. Mtg., 98 (1939), Abs. Papers, pp. A5, B4–6, 8, 13, 14*).—Abstracts of the following papers, dealing with subjects of significance in animal nutrition from the agricultural and food chemistry and biological chemistry sections, are noted: Meeting the Protein Requirements of Swine With Rations Containing Low Protein Tankage, by R. C. Miller and T. B. Keith (Pa. State Col.); The Role of Xanthophylls in the Ration of the Fowl, by W. J. Peterson, J. S. Hughes, and H. M. Scott (Kans. State Col.); The Absorption of Vitamin A by Dogs, by S. W. Clausen, B. B. Breese, Jr., and A. B. McCoord; The Anti Gray Hair Vitamin, a New Factor of the Vitamin B-Complex, by G. Lunde and H. Kringstad; The Role of Vitamin B Complex With Respect to Weight Restoration in the Pigeon, by A. D. Emmett, G. E. Peacock, and R. A. Brown; and Cystine and Methionine as Dietary Lactagogues, by J. R. Haag and L. D. Wright (Oreg. State Col.).

**[Abstracts of papers on animal nutrition presented at the 34th annual meeting of the American Society of Biological Chemists]** (*Jour. Biol. Chem., 133 (1940), No. 3, pp. v, vi, xiv–xvi, xxvii, xli, xlii, xlv, lvi, lxv, lxvi, lxviii, lxix, lxxi–lxxiv, lxxxiii, lxxxvi, lxxxix, xc, xcii*).—Abstracts of the following papers pertaining to animal nutrition are noted: Some Observations on Pantothenic Acid (Chick Antidermatitis Factor), by S. H. Babcock, Jr., and T. H. Jukes (Univ. Calif.); The Effect of Adrenalectomy on the Deposition in the Liver of Spectroscopically Active Fatty Acids, by R. H. Barnes, E. S. Miller, and G. O. Burr (Univ. Minn.); Influence of Parathyroid Deficiency on Reproductive Success in the Albino Rat, by M. Bodansky and V. B. Duff; Nutritive Value of Zein Hydrolysates, by R. Borchers and C. P. Berg; Glycocyamine and Methionine as Precursors of Creatine in Animal Tissues, by H. Borsook and J. W. Dubnoff; Intravenous Fat Is Not a Precursor of Cholic Acid in the Dog, by M. E. Doster-Virtue and R. W. Virtue; Studies on Additional Factors Required by the Chick, by D. M. Hegsted, J. J. Oleson, C. A. Elvehjem, and E. B. Hart (Univ. Wis.); Anemia From Lysine Deficiency in Deaminized Casein, by A. G. Hogan, E. L. Powell, and R. E. Guerrant (Univ. Mo.); A Rapid Photoelectric Method for the Determination of

Vitamin A and Carotene in Milk, by C. J. Koehn (Ala. Polytech. Inst.); Synthesis of Members of the Vitamin B Complex in the Rumen of the Cow, by L. W. McElroy and H. Goss (Univ. Calif.); The Effect of Iodine and Other Mineral Supplements on Cholesterol-Induced Atherosclerosis in Rabbits, by H. S. Mitchell, M. F. Goldfaden, and G. J. Hadro (Mass. State Col.); The Nature of the Blood and Tissue Changes Produced by Feeding Cholesterol to Guinea Pigs, by R. Okey and V. D. Greaves (Univ. Calif.); The Nutritive Value of Cottonseed Meal, by H. S. Olcott; Factor W and Pantothenic Acid in the Nutrition of the Rat, by J. J. Oleson and S. Black (Univ. Wis.); The Supplementary Relationship of Vitamin $B_6$ and Unsaturated Fatty Acids, by W. D. Salmon (Ala. Polytech. Inst.); Evidence of the Complex Nature of the Alcoholic Precipitate Factor Required by the Chick, by A. E. Schumacher, G. F. Heuser, and L. C. Norris (Cornell Univ.); Effect of Certain Fats Upon the Utilization of Carotene, by W. C. Sherman (Ala. Polytech. Inst.); and Pantothenic Acid Content of Tissues of Chicks on Diets Deficient in This Substance, by E. E. Snell, D. Pennington, and R. J. Williams.

**The applicability of the quantitative indicator method as determined by a study of the movement of food in the gastrointestinal tract** [trans. title], L. Paloheimo (*Biedermanns Zentbl., Abt. B, Tierernähr., 11 (1939), No. 4–5, pp. 370–388, figs. 3; Eng. abs., pp. 386, 387*).—A critical study was made concerning the use of the quantitative indicator method for determining the digestibility of feeds. Chromium oxide was used as an indicator in trials involving both rats and cattle. In addition to the conventional analyses of feeds and feces, animals were sacrificed at various intervals after the ingestion of feed, and the contents of various sections of the alimentary tract were analyzed for the presence of chromium. With both species a tendency was observed for irregular movement of food through the tract and a piling up by the different portions of ingested feed in certain sections of the tract. It was evident that the stomach contents were not emptied in the same succession with which the food entered the stomach. A high percentage of the chromium present in feed was still present in the rumen and reticulum of cattle from 21 to 25 hr. after it was ingested. The level of feed intake also apparently increased the rate of emptying of the forestomachs of cattle.

**The carotene (provitamin A) content of Oklahoma feeds**, R. Wall (*Oklahoma Sta. Bul. 242 (1940), pp. 15*).—Data are presented on the carotene content of a wide range of Oklahoma forage plants in the green state, immediately after drying, and after varying periods of storage. The range of carotene values is similar to that reported from other areas, with a relatively wide variation due to the variable type of climate characteristic of that State. In general, carotene content of the plants increased up to the time of blooming, and then decreased. It was influenced by the season in accordance with the favorableness of conditions for growth. Properly cured hay contained about one-half as much carotene as that in the green forage. It dropped to about one-third that of the green plant after 6 months' storage under good conditions. Carotene in silage was quite stable over long storage periods, averaging at least one-half of the initial value after 6 mo. The intensity of green color proved to be a useful qualitative index of the carotene content of the feed. Samples stored in alcohol at 0° C. showed rather high carotene losses, indicating that this method of preservation is not suitable for holding samples for carotene determination.

**Biochemical studies on $B_1$ aviataminosis in animals and man** [trans. title], B. Carlström, K. Myrbäck, N. Holmin, and A. Larsson (*Biedermanns Zentbl., Abt. B. Tierernähr., 11 (1939), No. 4–5, pp. 322–356; Eng. abs., pp. 354, 355*).—

The authors discuss the origin of vitamin $B_1$ deficiency and present information on the blood picture and characteristic deficiency symptoms of $B_1$ avitaminosis in blue foxes, cattle, horses, and man.

**The prevention of nutritional muscular dystrophy in guinea pigs with vitamin E,** N. SHIMOTORI, G. A. EMERSON, and H. M. EVANS. (Univ. Calif.). (*Jour. Nutr., 19 (1940), No. 6, pp. 547–554*).—A more comprehensive report of research previously noted (E. S. R., 82, p. 372).

**Iodine in animal nutrition,** B. W. FAIRBANKS and E. CURZON. (Univ. Ill.). (*North Amer. Vet., 21 (1940), No. 1, pp. 25–28*).—Review, with 32 references.

**Cystine and methionine for growth and lactation,** J. R. HAAG and L. D. WRIGHT. (Oreg. Expt. Sta.). (*Jour. Nutr., 19 (1940), No. 6, pp. 563–568*).—A more complete report of research previously noted (E. S. R., 82, p. 371).

**Feeding trials with dried whey** [trans. title], H. BÜNGER, E. FISSMER, W. HABBE, H. SCHMIDT, K. BOEHM, and F. REISING (*Biedermanns Zentbl., Abt. B, Tierernähr., 11 (1939), No. 4–5, pp. 276–300, fig. 1; Eng. abs., p. 300*).—Dried whey containing 90 percent of dry matter, 9 percent of digestible crude protein, and from 67 to 68 percent of total digestible nutrients was successfully fed as a supplement to the regular ration to pigs and dairy heifers, providing the daily intake per animal did not exceed about 0.5 kg. of the whey. Larger quantities in the diet tended to depress the appetite of the animals. The presence of dried whey in the ration increased the water consumption of both species.

**The utilization of different feeding stuffs by rabbits as compared with wethers and pigs** [trans. title], K. NEHRING and W. SCHRAMM (*Biedermanns Zentbl., Abt. B, Tierernähr., 11 (1939), No. 4–5, pp. 301–321, figs. 2; Eng. abs., p. 321*).—In a series of trials the relative digestion and utilization of dry roughages, silages, grain, and potatoes by these three species were compared. With dry roughages similar coefficients of digestibility for all nutrients except crude fiber were obtained in trials with rabbits and wethers. The digestibility of crude fiber was significantly lower by the rabbit than by the wether. The two species were about equally efficient in digesting all components of silage, indicating that the digestibility of crude fiber in green plants by rabbits is higher than that from dried plants. Rabbits and pigs utilized grains and potatoes with approximately the same degree of efficiency. It appeared that digestibility coefficients obtained with one species could be applied to the others, except that for crude fiber.

**Variations in the blood calcium and phosphorus with the age of the dog,** H. D. ANDERSON and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 134 (1940), No. 1, pp. 217–228, figs. 3*).—Analyses of blood samples drawn from dogs at periodic intervals from birth to 2 yr. of age revealed a progressive decrease in inorganic phosphorus throughout the growing period. The level of blood calcium was highly variable, but showed a slight downward trend during the period of maturation. Following a mild vitamin D deficiency in dogs, the administration of cod-liver oil produced a rise in inorganic phosphorus and a fall in the calcium level of the blood. A sharp rise in calcium invariably accompanied a sharp fall in inorganic phosphorus. The trends noted are considered normal for dogs.

**Four centuries of Florida ranching,** G. H. DACY (*St. Louis, Mo.: Britt Ptg. Co., [1940], pp. 310+[1], [figs. 90]*).—An interesting nontechnical history of the beef cattle industry in Florida.

**The estimation of methane production by cattle,** J. W. BRATZLER and E. B. FORBES. (Pa. Expt. Sta.). (*Jour. Nutr., 19 (1940), No. 6, pp. 611–613, fig. 1*).—Based on 130 measurements of methane by combustion, each representing 2 or 3 days of continuous collection, methane production bore a close rela-

tionship to the intake of digestible carbohydrates. This relationship is expressed by the formula $E=4.012X+17.68$, in which $E$ represents grams of methane produced and $X$ hundreds of grams of carbohydrate digested. This formula is applicable over a digestible carbohydrate intake range of from 900 to 5,800 gm. per day.

**Destruction of ascorbic acid in the rumen of the dairy cow,** C. A. KNIGHT, R. A. DUTCHER, N. B. GUERRANT, and S. I. BECHDEL. (Pa. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 44 (1940), No. 1, pp. 90–93, figs. 2*).—In the described experiments, a Holstein cow having a rumen fistula was fed measured amounts of synthetic ascorbic acid mixed with corn silage; also ascorbic acid was placed directly in the rumen through the fistula opening. In no instance was any increase in ascorbic acid values of the blood plasma or milk observed as compared with values obtained when the cow was on a standard ration without vitamin supplement. A slight increase occurred in the amount of ascorbic acid found in the 24-hr. sample of urine for the periods during which the vitamin was administered. Analyses of samples of the rumen contents taken at regular intervals after the administration of ascorbic acid revealed a rapid and pronounced destruction of ascorbic acid in the rumen. Ascorbic acid added to rumen contents in vitro stored in dark-glass stoppered bottles at 39°–42° C. disappeared at much the same rate as that in the in vivo experiments.

**The protein requirements of working horses at rest and at various rates of work, I, II** [trans. title], H. NITSCHE (*Biedermanns Zentbl., Abt. B, Tierernähr., 11 (1939), Nos. 3, pp. 214–244, figs. 2; Eng. abs., p. 244; 4–5, pp. 245–272, fig. 1; Eng. abs., pp. 270, 271*).—A modification of the Kellner feeding standard for working horses is presented, based on the results of 15 years' work at the university of Breslau. The protein requirement of the resting horse is affected by environmental conditions varying with breed, age, state of nutrition, and especially with the biological value of the feed protein. With a ration of oats, hay, and straw, the requirements of the resting horse amounted to 53–68 gm. of digestible crude protein and 48–59 gm. of digestible pure protein per 100 kg. of live weight. Employing a new type of apparatus for measuring force, as described, it was found that the requirements of the horse for digestible pure protein did not increase proportionately with increasing rates of work, the requirements per unit of work decreasing as the rate of work increased.

**Indiana stallion enrollment.—Report of stallion enrollment board for the year 1939, with lists of stallions and jacks enrolled** (*Indiana Sta. Cir. 253 (1939), pp. 44, figs. 3*).—A directory of enrollments and renewals issued from January 1 to December 31, 1939, classified by counties, and a brief résumé of stallion laws in other States (E. S. R., 81, p. 259).

**Some factors in lamb production associated with size and type in mutton sheep,** G. A. BRANAMAN. (Ill. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *60 (1940), No. 7, pp. 473–486*).—Trials were conducted to compare the rate and efficiency of gain and the quality of carcass produced by purebred Southdown and Hampshire lambs and by crossbred lambs from grade western ewes mated to Southdown, Hampshire, and Shropshire rams. When full-fed appropriate rations the purebred ewes of each breed consumed feed approximately in proportion to body weight. However, the feed consumption of the lambs when fed a maintenance ration or when full-fed for rapid growth and fattening was more nearly in proportion to the three-fourths power function of body weight. Hampshire yearling lambs on full feed digested nitrogen significantly more efficiently than Southdown lambs. Coefficients of digestibility for other nutrients were similar for the two lots. A 120-percent Hampshire lamb crop was found necessary to produce lean meat in Choice carcasses as efficiently with

respect to total feed as a 100-percent Southdown lamb crop. Well-fed Hampshire single lambs attained Choice market finish approximately 6 weeks younger than Southdown single lambs or Hampshire twins. Southdown lambs of Choice market quality gave higher yields of dressed carcass, boneless meat, and separable lean meat than Hampshire lambs of similar finish.

In tests with crossbred lambs, those sired by Southdown rams were of greatest value, followed in order by those sired by Hampshire and Shropshire rams. The Hampshire-sired lambs were slightly heaviest, while the Southdown-sired lambs were highest in market grade.

**The feeding value of artificially dried sweet lupines** [trans. title], W. Kirsch and H. Jantzon (*Biedermanns Zentbl., Abt. B, Tierernähr, 11 (1939), No. 4–5, pp. 273–275; Eng. abs., p. 275*).—Digestion trials with wethers revealed the following coefficients of digestibility for artificially dried sweet lupines (free of bitter principle): Crude protein 60.2, true protein 61.5, amide 47.3, crude fat 76.5, crude fiber 65.1, and nitrogen-free extract 75.2. The material contained 11.82 kg. of digestible crude protein and 10.93 kg. of digestible pure protein per 100 kg. of dry matter.

[**Poultry investigations in New Jersey**] (*New Jersey Stas. Rpt. 1939, pp. 9, 10, 109–114*).—Progress results (E. S. R., 82, p. 236) are briefly presented for the following: Fat requirements and metabolism of the chicken; changing trends in egg production and mortality of layers in the State egg-laying contests; economic significance of inherited longevity tendency in chickens; value of short-season egg production performance as a basis for selecting layers; development of a strain of White Leghorns especially suited to individual cage management; merits of a stud-mating system; practicability of year-round hatching of chicks; comparison of the effects of slow, medium, and fast growth in White Leghorn pullets; rate and efficiency of egg production by Khaki-Campbell ducks; and breeding and feeding for improved squab production.

**Factors in mixing rations for poultry**, C. S. Platt (*New Jersey Stas. Hints to Poultrymen, 27 (1940), No. 4, pp. 4*).—Practical considerations are discussed.

**Proso millet and oats in poultry rations**, W. O. Wilson and W. E. Poley (*South Dakota Sta. Bul. 337 (1940), pp. 31, figs. 7*).—Tests with proso millet and oats in starting, growing, and laying rations for chickens are summarized. From the results of 16 trials (62 lots) with young chicks comparing the various single grains and grain mixtures in starting rations, it was found that there were only slight differences in the pounds of feed required per pound of gain when corn, wheat, barley, and oats were compared with millet. Best results were obtained when equal parts of proso millet and any one of the other grains were fed. Fed singly, millet and oats each proved to be ±93 percent as efficient as yellow corn. There was no apparent difference in the value of white and red proso millet. Better growth of chicks was evident with 15 percent each of wheat bran and wheat middlings included in the ration than with 30 percent of ground wheat. Amber cane was equally as effective as proso in promoting growth to 8 weeks of age, but resulted in higher mortality than did millet. Used in growing rations, red proso was equal to yellow corn, while oats had about 80 percent the value of corn. Growing birds consumed proso more readily than cracked yellow corn. From the results of 5 tests with laying hens (18 lots), it is concluded that red or white proso was approximately equal to either yellow corn or oats for egg production and maintenance of body weight. Use of whole millet instead of ground millet supported good egg production but resulted in a somewhat higher feed requirement per dozen eggs produced. Neither egg production nor hatchability was improved by increasing the amount of alfalfa leaf meal or meat and bone scraps in the mash mixture. Suggested feed mixtures using proso millet are included.

**Fat requirements of the growing chick,** W. C. Russell, M. W. Taylor, and L. J. Polskin. (N. J. Expt. Stas.). (*Jour. Nutr., 19 (1940), No. 6, pp. 555–562*).—The growth rate of chicks maintained on an ether-extracted ration composed of natural feeding stuffs and containing approximately 0.1 percent fat was compared with that of chicks on a normal ration containing 4.1 percent fat. The growth rate of chicks to 14 weeks of age on the low-fat diet supplemented with all known essential dietary factors was not significantly below that of the control group. Chicks on the low-fat diet utilized crystalline carotene despite the very low level of fat intake. Analyses of body fat showed that that formed on a low-fat diet was more saturated than that for normally fed chicks. However, liver fat from the two groups showed essentially the same degree of saturation.

**Growth and development, with special reference to domestic animals.—LI, Seasonal metabolic and endocrine rhythms in the domestic fowl,** C. F. Winchester (*Missouri Sta. Res. Bul. 315 (1940), pp. 52, figs. 8*).—This series is here continued (E. S. R., 81, p. 99). The design and construction of a four-chamber Regnault-Reiset metabolism apparatus adapted to chickens and also the adaptation of an electric stethoscope to measurement of heart rates of fowls while resting in closed chambers are described. Measurements of the heat production and heart rates of laying pullets of the New Hampshire breed revealed a rough parallelism between fasting heat production, heart rate, and egg production. The correlation between heart rate and metabolism was not great enough, however, to permit prediction of one from the other. Considerable daily fluctuations in the metabolism and heart rate of individuals suggested the need of observations on relatively large numbers of individuals if statistically significant results are to be obtained.

The influence of the thyroid on egg production was also studied. Following thyroidectomy birds which had been producing at a high level dropped to a very low rate. Weekly injections of 1 and 2 mg. of thyroxine per kilogram$^{0.73}$ restored these hens to 40 and 60 percent normal production, and preoperative fasting metabolism was restored. Thyroidectomized hens not receiving thyroxine remained at a low production level throughout. A critical review of the literature on photo- and thermoperiodicity and an extensive bibliography are included.

## *DAIRY FARMING—DAIRYING*

**[Abstracts of papers presented at the 35th annual meeting of the American Dairy Science Association]** (*Jour. Dairy Sci., 23 (1940), No. 6, pp. 487–530, 536, 537, 538–540, 543, 544, 550–576*).—Following are listed the titles and authors of papers pertaining either to dairy manufacturing or dairy production, presented at the annual meeting of the association (E. S. R., 81, p. 701) held at West Lafayette, Ind., June 24–28, 1940: The Relation of Acidity and Total Solids Contents per Gallon to the Physical and Chemical Properties of High Serum Solids Ice Cream, by C. W. Decker and W. C. Hall (p. 487) (Mo. Expt. Sta.); Characteristics of Base Exchange Treated Skimmilk Powder in Ice Cream, by J. H. Erb, R. B. Hornberger, and J. D. Bowers (pp. 487, 488) (Ohio State Univ.); Fresh and Frozen Plain, Superheated, and Sweetened Condensed Skimmilk for Ice Cream, by L. K. Crowe, D. D. Deane, and H. H. Winn (pp. 488, 489) (Univ. Nebr.); Replacing Cane Sugar With Variable Increments of Dextrose Sugars and the Effect Upon the Physical and Chemical Properties of Ice Cream at Different Serving Temperatures, by R. J. Cooley, W. H. E. Reid, and W. C. Hall (pp. 489, 490) (Mo. Sta.); Use of High Conversion Corn Sirup in the Manufacture of Ice Cream and Ices, by G. J. Edman and P. H. Tracy (p. 490) (Univ. Ill.); Corn Sugar and Sirups for Frozen Desserts, by A. C. Dahlberg

and E. S. Penczek (pp. 490, 491) (N. Y. State Sta.); Factors Affecting the Viscosity of Ice Cream Mixes Containing Sodium-Phospho-Alginate, by J. H. Hetrick and J. H. Erb (pp. 491, 492) (Ohio State Univ.); Influence of Drawing Temperature as a Factor Affecting the Stabilizing Action of Gelatin and the Body and Texture of Batch and Continuous Frozen Ice Cream, by R. E. Heyl and P. H. Tracy (pp. 492, 493) (Univ. Ill.); The Application of Motion Pictures as a Medium in Showing the Influence of Several Factors Upon the Stability and Meltdown Properties of Ice Cream, by W. S. Arbuckle, C. W. Decker, and R. J. Cooley (p. 493) (Mo. Sta.); A Study of the Coliform Group in Ice Cream, by H. J. Fournelle and H. Macy (pp. 493, 494) (Univ. Minn.); Prevention of Oxidized Flavor in Frozen Cream by Homogenization and High Temperature Pasteurization, by G. C. McFarland and L. H. Burgwald (pp. 494–496) (Ohio State Univ.); A Survey of the Objectionable Feed Flavors in Milk Throughout the North American Continent, by P. A. Downs (p. 496) (Univ. Nebr.); Interrelation of Certain Metals and Metallic Ions and the Development of Oxidized Flavor in Milk, by O. F. Garrett (pp. 496, 497), and A Comparison of the Effects of Seven Different Types of Roughages on the Color and Flavor of Milk, by O. F. Garrett, R. B. Arnold, and G. H. Hartman (pp. 497, 498) (both N. J. Stas.); Recent Studies on Oxidized Flavor in Milk, by W. J. Corbett and P. H. Tracy (pp. 498, 499) (Univ. Ill.); Milk Flavor Study, by H. B. Henderson, T. B. Harrison, and C. E. Wylie (pp. 499, 500) (Univ. Tenn.); The Relationship of Quality of Hay to the Development of Oxidized Flavor in Milk, by W. C. Brown, A. H. VanLandingham, and C. E. Weakley, Jr. (pp. 500, 501) (W. Va. Sta.); The Effect of Feeding Cod-Liver Oil on the Goaty and Oxidized Flavors, and Vitamin C in Milk, by E. S. Guthrie (pp. 501, 502) (Cornell Univ.); Resistance of Thermoduric Bacteria to Chlorine Disinfection, by A. C. Maack and M. J. Prucha (p. 502) (Univ. Ill.); Is the Standard Plate Count a Proper Yardstick of Quality? by M. E. Parker (pp. 502, 503); Control of Sediment in Homogenized Milk, by A. J. Hahn and P. H. Tracy (pp. 503, 504) (Univ. Ill.); A Study of the Effect of Added Iodine and Hydrogen Peroxide to Milk on the Enzymes, by M. Glickstein, W. S. Mueller, and J. H. Frandsen (p. 504) (Mass. State Col.); A Study of the Time-Temperature Relationships in Pasteurization of Milk as Regards Creaming, Phosphatase, and Bacterial Destruction, by R. F. Holland and A. C. Dahlberg (pp. 504, 505) (N. Y. State Sta.); The Relationship of Changes in the Chemical Composition of Milk to the Development of Mastitis, by A. H. VanLandingham, C. E. Weakley, Jr., and E. N. Moore (pp. 505, 506) (W. Va. Sta.); The Determination of Copper in Butter, by W. F. Epple and B. E. Horrall (pp. 506, 507) (Purdue Univ.); The Uniformity of Butter Composition as Related to Type of Churn, by S. L. Tuckey and P. H. Tracy (pp. 507, 508), and Changes in the Bacterial Flora of Butter, by C. A. Wilson and M. J. Prucha (pp. 508, 509) (both Univ. Ill.); Some Preliminary Observations on the Effectiveness of Propionates as Mold Inhibitors on Dairy Products, by J. D. Ingle (p. 509); Propionic Acid and Its Calcium and Sodium Salts as Inhibitors of Mold Growth, by J. C. Olson and H. Macy (pp. 509, 510) (Univ. Minn.); Some of the Factors Affecting the Phosphatase Values of Butter, by W. H. Brown (pp. 510, 511) (Purdue Univ.); Effect of Salt on the Keeping Quality of Cream, by W. J. Caulfield, F. E. Nelson, and W. H. Martin (pp. 511, 512) (Kans. Sta.); The Chemical and Bacteriological Changes in Brick Cheese During Manufacture, by J. C. Garey, E. M. Foster, and W. C. Frazier (pp. 512, 513) (Univ. Wis.); The Control of Abnormal Bacterial Fermentations in the Manufacture of Swiss Cheese, by L. A. Burkey, M. Rogosa, and R. R. Farrar (pp. 513, 514) (U. S. D. A.); The Effect of Heat-Treatment of Milk on the Activity of Swiss Cheese

Starters, by M. E. Tyler and H. H. Weiser (pp. 514, 515) (Ohio State Univ.); The Standardization of Fat in Swiss Cheese and the Relationship of Fat to Quality, by G. P. Sanders, R. R. Farrar, F. Feutz, and R. E. Hardell (pp. 515, 516) (U. S. D. A. coop. Univ. Wis. and Ohio State Univ.); Improving the Quality of Swiss Cheese Through Applied Research and Technical Control, by R. R. Farrar (pp. 516, 517) (U. S. D. A.); Relation of Salt Content to Bitter Flavor Development in Cheddar Cheese, by S. L. Tuckey and H. A. Ruehe (pp. 517, 518) (Univ. Ill.); More Accurate Determinations of Volatile Fatty Acid and Other Changes as a Means to Study Cheddar Cheese Curing, by J. C. Marquardt and A. C. Dahlberg (pp. 518, 519) (N. Y. State Sta.); Effect of Lipolytic Enzymes on the Ripening of Cheddar Cheese, by C. B. Lane and B. W. Hammer (p. 519) (Iowa Sta.); The Purification of Rennin, by C. L. Hankinson and L. S. Palmer (p. 520) (Univ. Minn.); The Effect of Standardizing the Acidity on the Methods and Physical and Chemical Properties of Cottage Cheese and Cultured Buttermilk, by L. E. Mull and W. H. E. Reid (p. 521) (Mo. Sta.); The Use of Homogenized Milk in the Manufacture of Cottage Cheese, by D. W. Glover and L. H. Burgwald (pp. 521, 522) (Ohio State Univ.); The Effect of Temperature Upon Score Value and Serving Properties of Cheese, by W. S. Arbuckle, J. E. Edmondson, and L. E. Mull (pp. 522, 523) (Mo. Sta.); Economic Barriers Affecting the Dairy Industry, by H. A. Ruehe (pp. 523, 524) (Univ. Ill.); The Effect of Cocoa Upon the Digestibility of Milk Proteins, by L. D. Lipman and W. S. Mueller (pp. 524, 525) (Mass. State Col.); The Acid Hydrolysis of Lactose and the Preparation of Hydrolyzed Lactose Sirup, by G. A. Ramsdell and B. H. Webb (p. 525) (U. S. D. A.); Some Properties of Different Combinations of Whey and Other Materials Which Dry Satisfactorily on the Atmospheric Drum Drier, by E. L. Jack and A. J. Wasson (pp. 525, 526) (Univ. Calif.); A More Precise Method for Estimating Fat in the Babcock Test, by E. O. Herreid (pp. 526, 527), and The Effect of Specific Gravity and Coefficient of Expansion of Butterfat on the Accuracy of the Babcock Test, by R. Jenness (pp. 527, 528) (both Vt. Sta.); Observations on the Distribution of *Pseudomonas fragi*, by H. B. Morrison and B. W. Hammer (pp. 528, 529) (Ky. and Iowa Stas.); The Serological Integrity of *Streptococcus lactis*, by J. M. Sherman, K. L. Smiley, and C. F. Niven, Jr. (pp. 529, 530) (Cornell Univ.); Vitamin C for Sterile or Partially Sterile Sires, by P. H. Phillips and H. A. Lardy (p. 530) (Univ. Wis.); The Ejection of Milk From the Mammary Gland, by F. Ely and W. E. Petersen (pp. 536, 537) (Ky. and Minn. Stas.); The Fat Metabolism of the Mammary Gland of the Cow, by J. C. Shaw and W. E. Petersen (pp. 538, 539), Some Factors Influencing the Completeness of Milking, by K. Miller and W. E. Petersen (p. 539), and The Effect of Dinitrophenol Administration on Milk and Milk Fat, by G. O. Graf, L. M. Ludwick, and W. E. Petersen (pp. 539, 540) (all. Univ. Minn.); The pH of the Bovine Mammary Gland, by P. L. Kelly (p. 540) (Ark. Sta.); The Effect of Nembutal Anesthesia on the Rate of Milk Secretion, the Respiratory Quotient, and Uptake of Milk Precursors by the Lactating Mammary Gland, by E. P. Reineke (pp. 543, 544) (Mo. Sta.); A Modification of the Allen Blood Fat Procedure, by J. C. Shaw (p. 544) (Univ. Conn.); Some Factors Relating to Bloat in Cattle, by D. Espe and C. Y. Cannon (p. 550) (Iowa State Col.); Extreme Rarity of Cancerous Growths in the Cow's Udder, by W. W. Swett, C. A. Matthews, and R. R. Graves (p. 551) (U. S. D. A.); Heavy Corn Feeding as a Contributory Factor to the Development of Mastitis, by E. N. Moore and H. O. Henderson (pp. 551, 552) (W. Va. Sta.); Short-Wave Diathermy Treatment of Bovine Mastitis, by C. W. McIntyre, A. C. Ragsdale, and E. R. Garrison (pp. 552, 553) (Mo. Sta. coop. U. S. D. A.); Purified Diet Studies With

Calves, by P. E. Johnson, J. K. Loosli, and L. A. Maynard (pp. 553, 554) (Cornell Univ.); Changes in pH and in Bacterial Count of Milks Sham Fed to a Dairy Calf, by G. H. Wise, G. W. Anderson, and J. C. Jones (pp. 554, 555) (S. C. Sta.); Studies With Barn Air-Cured Alfalfa Hay, by C. E. Wylie, S. A. Hinton, and J. A. Schaller (pp. 555, 556) (Univ. Tenn. et al.); Dried Grapefruit Pulp for Milk Production, by P. T. D. Arnold, R. B. Becker, and W. M. Neal (p. 556) (Fla. Sta.); The Value of the Qualitative Color Test in the Study of Ketosis, by C. W. Duncan and C. F. Huffman (pp. 556, 557), and Blood Sugar and Carbon Dioxide Combining Power of Plasma in Relation to Ketosis in Dairy Cattle, by J. F. Sykes, C. W. Duncan, and C. F. Huffman (pp. 557, 558) (both Mich. Sta.); The Relationship of Fat Content in the Dairy Ration to Milk and Butterfat Production, by C. F. Monroe and W. E. Krauss (p. 558) (Ohio Sta.); Alfalfa Hay Cut at 3 Stages of Maturity—Its Yield, Chemical Composition, and Feeding Value for Milk Production, by J. R. Dawson, D. V. Kopland, and R. R. Graves (pp. 558, 559) (U. S. D. A.); Cystine as a Possible Deficiency in a Ration of Alfalfa Hay for Milk Production, by C. F. Huffman and C. W. Duncan (p. 559) (Mich. Sta.); The Feeding Value of Rye Stillage for Dairy Cows, by K. L. Turk and M. H. Berry (pp. 560, 561) (Md. Sta.); Fermentation Studies on Alfalfa Silage Prepared by the Phosphoric Acid and Molasses Methods, by H. D. McAuliffe, R. W. Stone, and S. I. Bechdel (p. 561) (Pa. State Col.); The Losses Resulting From the Ensiling of Legumes and Grasses With Varying Amounts of Phosphoric Aid, by O. L. Lepard and E. S. Savage (pp. 561, 562) (Cornell Univ.); Effect of Depth of Corn in the Silo on Weight of Corn Silage, by J. B. Shepherd (pp. 563, 564) (U. S. D. A.); Broomcorn Silage for Dairy Cattle, by K. E. Harshbarger and W. B. Nevens (p. 564) (Univ. Ill.); Comparison of *Lespedeza sericea* Silage, Alfalfa Silage, and Corn Silage for Dairy Cows, by S. A. Hinton and C. E. Wylie (pp. 564, 565) (Univ. Tenn.); Composition and Nutrient Value of Sugarcane as Fresh Forage, Shocked Fodder, and Silage, by W. M. Neal (pp. 565, 566) (Fla. Sta.); Is Timothy Hay Adequate in Calcium for Optimum Growth of Dairy Heifers? by H. T. Converse, E. A. Kane, and E. B. Meigs (pp. 566, 567) (U. S. D. A.); The Effect of Rations Deficient in Phosphorus and Protein on Ovulation, Estrus, and Reproduction in Dairy Heifers, by L. S. Palmer, T. W. Gullickson, W. L. Boyd, C. P. Fitch, and J. W. Nelson (pp. 567, 568) (Univ. Minn.); The Effect of Avitaminosis A Upon Vitamin C in the Bovine, by W. A. King, P. H. Phillips, M. E. Nesbit, I. W. Rupel, and G. Bohstedt (p. 568) (Univ. Wis.); Vitamin C in the Nutrition of Dairy Cattle (pp. 569, 570) and Blood Plasma Magnesium in Relation to the Vitamin D Deficiency of Mature Dairy Cattle (pp. 570, 571), both by G. C. Wallis (S. Dak. Sta.); Vitamin E Potency of Certain Feedstuffs, by L. S. Palmer, J. W. Nelson, T. W. Gullickson, B. B. Migicovsky, and W. W. Kielley, pp. 571, 572) (Univ. Minn.); Carotene Content of Corn Silage, by E. A. Kane, H. G. Wiseman, L. A. Shinn, and C. A. Cary (pp. 572, 573) (U. S. D. A.): Changes in the Amounts of Carotene and Vitamin A and in the Composition of Milk Fat in Artificially Induced Mastitis, by P. G. Miller, E. J. Lease, and G. W. Anderson (pp. 573, 574) (S. C. Sta.); The Effects of Vitamin A Deficiency on the Young Male Bovine, by T. S. Sutton, W. E. Krauss, and S. L. Hansard (p. 574) (Ohio Sta. and State Univ.); Cerebrospinal Fluid Pressure and Vitamin A Deficiency, by L. A. Moore and J. F. Sykes (pp. 574, 575) (Mich. Sta.); The Effect of Carotene Consumption on the Milk Yield of Jersey Cows, by O. C. Copeland (p. 575) (Tex. Sta.); and The Vitamin A Requirements of Dairy Cows for the Production of Butter of High Vitamin A Value.—II, Relative Efficiency of Carotene (Dehydrated Alfalfa Hay) and Vitamin A, by J. W. Wilbur, J. H. Hilton, and S. M. Hauge (pp. 575, 576) (Purdue Univ.).

**[Investigations with dairy cattle and dairy products in New Jersey]** (*New Jersey Stas. Rpt. 1939, pp. 6–9, 38–42, 43–45*).—Brief progress reports (E. S. R., 82, p. 239) are presented for the following: Color pigmentation in the skin and milk of Guernsey cattle, including the effects of feeds on these characters; results of continued inbreeding in Holstein cattle; growth rate of dairy heifers on a sole roughage ration; citrus pulp as a carrier for molasses in preserving grass silage; phosphoric acid as a preservative and other aspects of grass silage production; improvement of pastures and grasslands; relation of dietary factors to milk flavor; influence of various endocrine secretions on milk and milk fat production; and sterilization of dairy equipment by irradiation.

**Roughage feeding of dairy cattle, H. S. Willard** (*Wyoming Sta. Bul. 237 (1940), pp. 27, figs. 7*).—The results of long-time experiments with dairy cows maintained solely on good-quality roughage rations as compared with grain and roughage feeding are further summarized (E. S. R., 72, p. 96). The reproduction and milk production records of cows fed only alfalfa hay and sweetclover pasture for several consecutive lactation periods indicate that satisfactory performance and a reasonably high level of production can be maintained under such a feeding regime. It appeared doubtful if Holstein cows with an inherent producing capacity of only from 30 to 40 lb. of milk at the peak of production will benefit by being fed grain to supplement good roughage rations. With the prices used for feed and dairy products in this experiment, grain feeding paid only with cows having an ability to produce from 50 to 60 lb. of milk daily soon after freshening. The marked stimulating effect of good pasture on milk production was shown. The increase in milk yield when cows were changed from alfalfa alone or alfalfa and grain to pasture was greater as the time from freshening lengthened. Grain had little effect in lowering hay consumption, suggesting that grain feeding should be considered as a means of increasing the total feed intake.

**Rate of growth by dairy calves and heifers on different rations, R. R. Graves, J. R. Dawson, D. V. Kopland, J. A. Simms, A. G. Van Horn, and S. L. Cathcart** (*U. S. Dept. Agr. Cir. 560 (1940), pp. 23, figs. 3*).—The results of four separate investigations are summarized. Skim milk was included in otherwise comparable rations fed to four groups of Holstein calves and heifers to ages of 6, 12, 18, and 24 mo., respectively. Average weights of heifers at 24 mo. of age were 1,061, 1,154, 1,108, and 1,159 lb., respectively, indicating that from the standpoint of growth there was little advantage in feeding skim milk after 12 mo. of age. Those receiving milk for 18 or 24 mo. showed somewhat higher breeding efficiency as heifers and produced slightly more milk during the first lactation than the other groups.

In another experiment sumac sorgo silage fed as a sole roughage plus 1 or 2 lb. of cottonseed meal per head daily was found to be an economical and efficient winter ration for Holstein heifers.

In two other trials Jersey heifers over 12 mo. of age fed unlimited quantities of artificially dried legume hay of good quality with pasture in season compared favorably in rate of growth with heifers receiving a conventional-type ration of grain and hay.

**The relation of bacteria and of oxygen to the flavor of milk susceptible to becoming oxidized, J. G. Leeder and E. O. Herreid** (*Vermont Sta. Bul. 457 (1940), pp. 15, figs. 5*).—Milk from cows known to consistently produce milk susceptible to oxidized flavor development was variously handled and treated in the trials described. Samples drawn from milking machine pails and stored under a reduced pressure of from 23 to 25 in. mercury showed a greatly reduced tendency for oxidized flavor development as compared with samples stored at

atmospheric pressure. The inoculation of samples held at normal pressure with incubated milk having a natural microflora resulted in a decreased oxygen content of milk due to bacterial growth, which in turn inhibited or prevented the development of oxidized flavor in 48 hr. Bacteria did not appear to be an important factor in the decrease of oxygen or prevention of oxidized flavor in the evacuated milk samples. No correlation was established between any given bacterial count and oxygen content or intensity of oxidized flavor.

## VETERINARY MEDICINE

**A textbook of bacteriology,** H. ZINSSER and S. BAYNE-JONES (*New York and London: D. Appleton-Century Co., [1939], 8. ed., rev., pp. XXVIII+990, figs. 116*).—In the preparation of this new edition of the work (E. S. R., 72, p. 381) the authors have made many changes and have rewritten large sections in order to incorporate the newer knowledge which has been gained in almost every division of the field covered. The section on pathogenic protozoa has been omitted. Each of the 73 chapters includes a copious list of references.

**[Work in animal pathology by the Florida Station]** (*Florida Sta. Rpt. 1939, pp. 72, 73, 78, 79*).—The work of the year (E. S. R., 81, p. 273) referred to includes the etiology of fowl paralysis, leukemia, and allied conditions in animals, by M. W. Emmel; a study of plants poisonous to livestock in Florida, by D. A. Sanders and E. West; and enzootic broncho-pneumonia (pneumoenteritis) of dairy calves, by Sanders (see p. 680).

**[Work in animal pathology by the New Jersey Stations]** (*New Jersey Stas. Rpt. 1939, pp. 42, 43*).—The work (E. S. R., 82, p. 249) reported relates to tests for determining mastitis in dairy cattle and a study of Bang's disease.

**[Work in animal parasitology by the Puerto Rico College Station]** (*Puerto Rico Col. Sta. Rpt. 1939, pp. 52–56*).—The work reported upon relates to studies of internal parasites of cattle and horses, and observations on parasites of various domestic animals and fowl, including the goat, monkey, pig, pigeon, and chicken.

**[Contributions on veterinary medicine]** (*U. S. Livestock Sanit. Assoc. Rpt., 43 (1939), pp. 18–69, 106–143, 145–221, 224–256, 275, 276, 278–284, figs. 9*).—Among the contributions presented at the annual meeting of the association held at Chicago in December 1939 are the following: Some Relations of Kidney Physiology to the Diagnosis of Kidney Disease, by R. M. Watrous (pp. 18–27); The Present Status of the Federal-State Bang's Disease Program, by A. E. Wight (pp. 28–35) (U. S. D. A.); Bang's Disease Control From the Standpoint of the Animal Breeder, by R. E. Short (pp. 35–38); Problems Arising in Bang's Disease Control in the Western States, by W. H. Hendricks (pp. 38–54); Preparation of *Brucella* Antigen, by A. Eichhorn and H. I. Thaller (pp. 55–66) (U. S. D. A.); Report of the Committee on Bang's Disease, by C. P. Fitch et al. (pp. 67–69); The General Tuberculosis Situation, by A. E. Wight (pp. 106–114) (U. S. D. A.); The Pathogenicity for Cattle of the Avian Tubercle Bacillus, by W. H. Feldman and A. G. Karlson (pp. 114–133); Reaccreditation of Modified Accredited Counties in the State of New York, by E. T. Faulder (pp. 133–137); Fundamentals of Animal Disease Control, by D. M. Campbell (pp. 137–143); Infectious Equine Encephalomyelitis in 1939, by H. W. Schoening, L. T. Giltner, and M. S. Shahan (pp. 145–150) (U. S. D. A.); Report of the Committee on Rabies, by H. W. Schoening et al. (pp. 151–161); Rabies Control From the Clinician's Viewpoint, by R. V. LaCroix (pp. 162–166); Some New Facts on Rabies Control in Europe, by A. Eichhorn (pp. 167–173), Field Control and Eradication of Avian Tuberculosis in Poultry and Swine in the Midwest, by J. P. Simmons (pp. 173–176), and Progress of the National Poultry Improvement Plan With Special Reference to

the Control of Pullorum Disease, by B. Winton (pp. 176–185) (all U. S. D. A.); Equine Encephalomyelitis in Avian Hosts, by F. R. Beaudette (pp. 185–203) (N. J. Expt. Stas.); The Control of Poultry Diseases by the Veterinarian—A Challenging Situation, by C. D. Carpenter (pp. 203–211); Turkey Disease Control in Commercial Flocks, by L. D. Frederick (pp. 212–217); Report of Committee on Transmissible Diseases of Swine, by C. N. McBryde et al. (pp. 218–221); Infectious Types of Swine Enteritis, by L. P. Doyle (pp. 224–231) (Ind. Sta.); Swine Enteritis in Veterinary Practice, by J. B. Bryant (pp. 231–242); Discussion of Swine Enteritis, by J. S. Koen (pp. 243–245) (U. S. D. A.); So-Called Protein Poisoning in the Feeding of Swine, by A. F. Schalk (pp. 245–254) (Ohio State Univ.); Report of Committee on Tick Eradication in 1939, by T. O. Booth et al. (pp. 275, 276); Report of the Committee on Transmissible Diseases of Poultry, by E. Jungherr et al. (pp. 278–282); and Report of the Committee on Miscellaneous Transmissible Diseases, by E. Records et al. (pp. 283, 284).

**[Studies in comparative physiology and pathology in Japan]** (*Jap. Jour. Vet. Sci., 1 (1939), No. 6, pp. 575–632, pls. 11, figs. 6*).—Contributions here presented (E. S. R., 83, p. 105) are: Complement Fixation in Rat Leprosy [trans. title], by T. Itihara (pp. 575–582, Ger. abs. p. 582); Artificial Infections of the Goat, Sheep, and Dogs With *Bacillus mallei*, by O. Itikawa (pp. 583–601, Eng. abs. pp. 599–601); Studies on Ticks Found in Manchoukuo—I, On Two Species of Tick From Cattle [*Dermacentor reticulatus* and *Hyalomma detritum albipictum*] at the Yamuyingtzu Stock-Farm Near Wangyehmiao, Inner Mongolia, Manchoukuo, by J. Yamashita (pp. 602–609, Eng. abs. p. 609); A Simple Method for Supplying Carbon Dioxide Gas to Culture Tubes, by R. Nobata (pp. 610–616, Eng. abs. pp. 615, 616); and Experimental Studies on Anthelmintics for the Stomach Worm *Haemonchus contortus* in Sheep—II, Experiments on the Anthelmintic Action of Carbon Tetrachloride Emulsion and Critique on the Efficacy of Copper Sulphate, by M. Yoshikawa and K. Somazawa (pp. 617–632, Eng. abs. pp. 631, 632) (see p. 682).

**The recovery of Vibrio foetus from aborted bovine foetuses and the significance of this organism as a cause of abortion in cattle, A. D. McEwen** (*Vet. Rec., 52 (1940), No. 18, pp. 337–340*).—During the 6 preceding years bacteriological examinations were made of 247 fetuses from 45 herds in which efforts were being made to control infectious abortion. *V. fetus* infection was found in 5 fetusus that came from 3 of the herds. The evidence from the 3 herds has shown that it was not responsible for any serious outbreak of abortion. It is thought that abortions due to *V. fetus* are generally sporadic and of little importance. The source of infection is said to remain obscure.

**Further observations on the wild rat as a carrier of Brucella abortus, T. J. Bosworth** (*Jour. Compar. Pathol. and Ther., 53 (1940), No. 1, pp. 42–49*.—In further work (E. S. R., 79, p. 390) the author has found the incidence of *B. abortus* infection among rats in Great Britain to be low, it having been recovered once only as the result of examining 167 individuals caught on infected farms. "It was not possible to determine the percentage of carriers of *Leptospira icterohaemorrhagiae* in this series of rats as they were not examined for some time after death. In three instances, however, the *Leptospira* was found to have remained alive in the tissues for more than 24 hr. and in two others for more than 48 hr. after the rats were killed. Two of the rats were carriers of tubercle bacilli. One of the strains concerned was shown to be of the bovine type; the other, though not fully examined, was probably identical. An attempt to convey *B. abortus* infection to cows by exposing their food for a period of 3 mo. to contamination by infected rats was unsuccessful."

**The presence of a capsule on Brucella cells, I. F. Huddleson.** (Mich. State Col.). (*Jour. Amer. Vet. Med. Assoc., 96 (1940), No. 759, pp. 708, 709,*

*fig. 1)*.—The technic which has given the most uniform success in the demonstration of capsules in *Brucella* cells is described. The capsule of *Brucella* cells possesses physical and chemical properties different from *Diplococcus pneumoniae* in that it is not easily removed and its size is not affected by incubation with specific serum.

**The treatment of streptococcic mastitis by infusion of the udder with entozon,** O. W. SCHALM. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc., 97 (1940), No. 760, pp. 20–27, figs. 2*).—The author has found entozon, a new compound that is composed of a mixture of nitroacridine rivanol lactate, amyl saccharine, and sodium biborate, to be highly lethal to *Streptococcus agalactiae*. In the work reported, 11 lactating and 11 dry cows, in 1 herd, having a total of 61 quarters shedding *S. agalactiae*, were treated. All quarters, 88 in number, were infused with entozon by gravity pressure. This resulted in the disappearance of *S. agalactiae* from 90 percent of the quarters. It is thought that entozon may prove to be useful in herds in which a mastitis-control program based on segregation is in force. The details of treatment, including cow histories, methods of application, and results obtained, are given in a table.

**Musca domestica, a vector of bovine mastitis (preliminary report),** D. A. SANDERS. (Fla. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 97 (1940), No. 761, pp. 120–122, 123, figs. 3*).—Report is made of observations of the habit of the housefly of crawling over the surface of the teats of cattle in the milking line to feed at the external teat orifices and then flying to the udder of other cattle in the same milking line. The flies were noted to crawl or fly alternately from one teat orifice to another of the same and of different individual cows in the corrals and milking sheds. Experiments conducted, a description of which is presented, have shown conclusively that the housefly is a natural vector of bovine mastitis.

**The differentiation of bovine and human strains of tuberculosis by the method of Bertrand, Bablet, and Bloch,** M. BEATTIE and R. NICEWONGER. (Univ. Calif.). (*Jour. Lab. and Clin. Med., 24 (1939), No. 12, pp. 1310–1312*).—The results of experiments conducted have led the authors to conclude that the reaction of the bovine strain of *Mycobacterium tuberculosis*, when inoculated into the brain of rabbits, is not unique since 19 strains obviously human in origin and proved by intravenous inoculation to be of the human type induced symptoms similar to those produced by known bovine strains and described by I. Bertrand, J. Bablet, and F. Bloch.[4] It is considered unwise to discard hastily the classic technic of intravenous injection in order to differentiate the bovine from the human type of *M. tuberculosis*.

**Tuberculin reactions in cattle due to infection with the human type of the tubercle bacillus,** F. W. NIELSEN and N. PLUM (*Skand. Vet. Tidskr., 30 (1940), No. 3, pp. 245–274; Swed. abs., pp. 272, 273*).—Considered in the course of this report is the question relating to cows infected with the human type excreting tubercle bacilli with the milk. The authors were unable to obtain growth of human tubercle bacilli in cultures from the milk of 90 cows of this category. On 3 farms where the animals were reacting on account of human infection, samples of mixed milk were examined daily for 1 week by inoculation of guinea pigs and by cultivation. It was not possible to demonstrate that the milk samples had contained tubercle bacilli. A list of 12 references is given.

**Bovine pseudorabies or "mad itch" virus,** R. GRAHAM, C. C. MORRILL, and L. E. BOLEY. (Univ. Ill.). (*Science, 91 (1940), No. 2374, pp. 623, 624*).—Attempts made to determine the relation of mad itch virus, described by Shope from cattle in Iowa (E. S. R., 65, p. 872) and subsequently shown to have an

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[4] Compt. Rend. Soc. Biol. [Paris], 124 (1937), No. 2, pp. 108–111.

immunological relation to pseudorabies (E. S. R., 69, p. 266), to that of a rarely occurring but fatal bovine pruritic syndrome met with in Illinois are reported. The clinical observations and pathological, bacteriological, and immunological tests with a syndrome resembling that of pseudorabies in a well-nourished Hereford steer in Illinois are considered to support the preliminary deduction that the virus is the same as that of pseudorabies or mad itch.

**Enzootic bronchopneumonia of dairy calves,** D. A. Sanders (*Florida Sta. Bul. 346 (1940), pp. 11*).—Enzootic broncho-pneumonia in young animals, known also as septic pneumonia or pneumoenteritis, a report on which has been noted (E. S. R., 80, p. 684), causes heavy loss among dairy calves confined in crowded insanitary permanent lots. Such conditions are favorable to development of various bacterial infections of the gastrointestinal tract and the umbilicus and to infestations with external and internal parasites. These parasites lower the body resistance of calves sufficiently to permit the micro-organisms colonizing in the respiratory passage to exert a pathogenic action resulting in development of broncho-pneumonia. Enzootic broncho-pneumonia has not been found on premises where strict sanitary methods of rearing calves are used. Incidence of the disease on affected premises has been reduced in proportion to employment of hygienic methods.

**The toxicity of red-stemmed peavine (=Astragalus emoryanus) for cattle, sheep, and goats,** F. P. Mathews. (Tex. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 97 (1940), No. 761, pp. 125–134, fig. 1*).—Report is made of an investigation of sheep and cattle losses resulting from grazing on red-stemmed pea vine, an annual plant of common occurrence in Texas from near Alpine on the west and north to El Paso and the New Mexico State line. The plant has been reported as occurring from western Texas to southeastern California and southward into Chihuahua and Coahuila, Mexico. It has been proved by the author to be toxic for cattle, sheep, and goats, the young plant being more toxic than those older or more mature. The characteristic symptoms were muscular incoordination and loss of weight with slow and doubtful recovery. In sheep difficult respiration also was observed. The plant was collected from three limestone areas and found to be toxic in all cases; that collected near Alpine from soil of igneous origin produced no toxic effects when fed to goats. The toxic principle was destroyed by drying the plant for 4 mo.

**Toxicity of selenium-cystine and some other organic selenium compounds,** A. L. Moxon. (Univ. Wis.). (*Jour. Amer. Pharm. Assoc., 29 (1940), No. 6, pp. 249–251*).—The author has found that the minimum lethal dose of selenium in the form of selenium-cystine when injected intraperitoneally into albino rats is 4 mg. per kilogram of body weight. This is equivalent to 8.44 mg. of selenium-cystine per kilogram of body weight.

**Reactions in horses following inoculation of chick-embryo vaccine,** R. Graham. (Univ. Ill.). (*Jour. Amer. Vet. Med. Assoc., 97 (1940), No. 760, pp. 38, 39, figs. 2*).—Reference is made to the possibility that some horses may become sensitized to certain chick proteins or substances in chick-embryo vaccine. It should not be concluded that only old vaccines are capable of inducing untoward reactions, since unfavorable reactions from fresh vaccines have occasionally been reported. Quite apart from the possible role played by hypersensitiveness of some horses to the vaccine, the possibility of sepsis incident to inoculation of vaccine cannot be entirely disregarded. Three fatal cases observed have led the author to urge the use of aseptic methods in inoculating vaccine.

**Reactions following administation of equine encephalomyelitis vaccine,** H. W. Schoening. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 97 (1940),*

*No. 760, pp. 39, 40, figs. 2).*—Reference is made to some severe reactions and losses of horses that have followed the second injection of encephalomyelitis vaccine. The exact cause or causes of these unfavorable reactions in horses following the injection of chick-embryo encephalomyelitis vaccine are not yet definitely known, but it appears probable that there is a relationship between the reaction and the age of the vaccine (and/or its handling) and the individual horse. Present observations indicate that apparently more reactions have occurred in animals that have been previously vaccinated. Attention is called to the author's earlier consideration of the causes of reactions that follow vaccination (E. S. R., 82, p. 107). The importance of a good technic of administration of the vaccine was stressed and also the fact that the injections should be given in widely separated places. It is desired again to emphasize these points. "There is laboratory evidence to show that a considerable immunity is engendered even with one injection of vaccine. A number of reports received this year indicate that some animals, following the second injection of vaccine, show a typical anaphylaxis, evidenced within a few hours following the administration of the second injection. More of these have been reported than in previous years. It is advisable to be prepared to give appropriate treatment to animals that might show typical anaphylaxis—2 cc. of 1:1,000 epinephrine subcutaneously, in extreme cases intravenously."

**Blood changes and post-mortem findings following intravenous inoculation of sheep with culture filtrates of Cl. welchii, types A, C, and D,** W. S. GORDON, J. STEWART, H. H. HOLMAN, and A. W. TAYLOR (*Jour. Pathol. and Bact., 50 (1940), No. 2, pp. 251–269, figs. 9*).—The experiments reported have led to the conclusion that whereas the toxin of *Clostridium welchii* type C produces no specific blood changes, that of type A produces a marked hemolytic anemia, while that of type D produces an anhydremia.

**"Swayback:" A demyelinating disease of lambs with affinities to Schilder's encephalitis in man,** J. R. M. INNES and G. D. SHEARER (*Jour. Compar. Pathol. and Ther., 53 (1940), No. 1, pp. 1–41, pls. 7, fig. 1*).—This contribution reports upon the history and geographical distribution, pathology, etiology, etc., of swayback, a nervous disorder of newborn and young lambs of different breeds occurring in many parts of England, Scotland, and Wales. It is presented with a list of 96 references to the literature.

**"Warfa" ("swayback") in lambs in North Derbyshire and its prevention by adding copper supplements to the diet of the ewes during gestation,** G. DUNLOP and H. E. WELLS (*Vet. Rec., 50 (1938), No. 37, pp. 1175–1182, fig. 1*).—Large scale field experiments to determine if warfa or swayback, a disease which affects lambs in a severe form in North Derbyshire, could be prevented are reported upon, the details being given in table form. The results show that the incidence of the disease has been greatly reduced among the offspring of ewes receiving licks with copper supplements. Cobalt and manganese had no effect. It is concluded that the disease can be controlled by feeding licks containing 0.3 percent copper to the ewes during the gestation period.

**Observations on copper poisoning,** A. EDEN (*Jour. Compar. Pathol. and Ther., 53 (1940), No. 1, pp. 90–111*).—The wide use of copper salts in agricultural and veterinary practice and the possibility of prophylactic use of copper for pregnant ewes in "swayback" areas, based on the recent association of copper deficiency with enzootic ataxia in Australia, as reported by Bennetts and Chapman (E. S. R., 78, p. 837), and with swayback in lambs in Great Britain, as reported above by Dunlop and Wells, have led to the present observations of acute and chronic copper poisoning in animals.

In the work reported the copper content of the fresh tissues of normal adult rabbits and sheep was found to lie "between 0.1 and 0.5 mg. percent except for sheep's liver which may have a range of from 0.2 to 29 mg. percent without any evidence of associated pathological change, although the greater proportion of values appear to lie under 2 mg. per 100 gm. Under conditions of acute copper poisoning the principal changes in the copper content of tissues lie in greatly increased values for liver and kidney. The relatively high liver content of the newly born animal is confirmed for rabbits, the figure falling to the adult level long before weaning, suggesting the mobilization of this copper for physiological purposes. The relevant literature on chronic copper poisoning is reviewed. Attempts to induce this condition in rabbits by feeding copper sulfate dried on to food were unsuccessful although evidence of considerable copper storage in the liver was obtained. Chronic intoxication was induced in sheep by daily quantities of 1.5 gm. copper sulfate either in the form of a drench or damped on to a palatable mixture of concentrates, the condition developing in periods of from 30 to 80 days. Clinical symptoms included dullness, depression, and anorexia, and post-mortem examination showed generally icterus, cirrhotic liver, and swollen and congested kidneys. Chemical studies on the blood during the course of chronic intoxication showed a slow rise in blood copper content to about twice the initial value until a day or two before death when a sharp 'premortal' rise to about 10 times the normal value occurred. There were no significant changes in blood sugar, inorganic phosphorus and calcium values, and only a slight rise in serum magnesium content at the terminal phase. Hemoglobin values showed considerable fluctuations. The copper content of the liver and, to a lesser extent, the kidneys [was] very considerably increased but relatively little change occurred in that of the remaining soft tissues examined."

Various factors such as form of administration of copper and species of animal are considered in the induction of experimental chronic copper poisoning, and the course of the disease is generally discussed. The invalidity of diagnosis of copper intoxication, either acute or chronic, by liver analysis per se is emphasized.

**Management for prevention of sneezeweed poisoning**, J. T. CASSADY. (U. S. D. A. and Colo. State Col.). (*Natl. Wool Grower, 30 (1940), No. 5, pp. 12–14, figs. 2*).

**Scrapie**, J. R. GREIG (*Highland and Agr. Soc. Scot. Trans., 5. ser., 52 (1940), pp. 71–90, figs. 2*).

**Experimental studies on anthelmintics of the stomach worm Haemonchus contortus in sheep.—I, On the resistance of the Haemonchus contortus to various medicaments** [trans. title], M. YOSIKAWA (*Res. Bul. Agr. Expt. Sta. So. Manchuria Ry. Co., No. 21 (1937), pp. 93–111*).

**Blood studies in normal hogs**, R. RODRIGUEZ MOLINA and J. OLIVER GONZALEZ (*Puerto Rico Jour. Pub. Health and Trop. Med., 15 (1940), No. 4, pp. 383–386*).—In the work reported, details of which are given in two full-page tables, peripheral blood studies were performed in two young, healthy, and apparently normal hogs during periods of 22 and 25 weeks at intervals of 1 week. "Erythrocyte and reticulocyte counts, hemoglobin determinations, volume of packed red cells, mean corpuscular volume, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration, leucocyte counts, [and] differential and platelet counts were performed each week. Observation on the morphology of all cell types was made also."

**Experimental liver damage associated with hematologic changes in hogs**, R. RODRIGUEZ MOLINA (*Puerto Rico Jour. Pub. Health and Trop. Med., 15 (1940), No. 4, pp. 362–372, figs. 4*).—Report is made of a series of blood

examinations of five hogs, including three experimental and two control animals, before and after ingestion of repeated and variable amounts of carbon tetrachloride. Similar studies were performed in one animal before and after repeated negative attempts at infestation with the cercaria of the trematode *Schistosoma mansoni* had been made. The changes in the blood of the hogs in which hepatic damage was produced by the administration of carbon tetrachloride are described. It was intended to produce chronic hepatic damage (cirrhosis), but it was believed the animals died before such changes were effected. "Macrocytosis (spherical) of the red cells and polycythemia were the most important changes in the blood observed during the course of carbon tetrachloride poisoning. A slight decrease in number of red cells in some animals was found, also. Macrocytosis was similar to that described by the author in advanced schistosomiasis mansoni in man. It is suggested that changes in red cell morphology and polycythemia are the result of liver damage and hemoconcentration respectively. The latter phenomenon was coincident with diarrhea and vomiting. It is assumed that macrocytosis occurred as a consequence of altered metabolism in the liver of the antianemic principle. Central necrosis of liver with fatty changes and bile stasis was observed post mortem in all animals dying from the effects of carbon tetrachloride."

**Observations on polyarthritis and on experimental Erysipelothrix infection of swine,** D. H. Collins and W. Goldie (*Jour. Pathol. and Bact., 50 (1940), No. 2, pp. 323–353, pls. 6*).—Pathological and bacteriological studies of nine cases of natural polyarthritis of swine resulted in the detection of swine erysipelas infection in four of the animals. "A similar arthritis followed repeated intravenous injections of cultures of *E. rhusiopathiae* in all of eight experimental swine. Subcutaneous injections of *E. rhusiopathiae* failed to produce arthritis in four swine, but observations on these animals were continued for only a short time. Both the experimentally induced and the naturally occurring disease can be described as a chronic proliferative arthritis. Its course and the sequence of pathological events in the joints are described. Arthritis in the experimental swine resulted from bacteriemia, and organisms were cultivated from joint material, particularly in the early stages of the disease. Some animals harbored viable organisms up to 8 mo. after injection, but many grossly arthritic joints were sterile. Arthritis followed single injections in six pigs, only three of which had been rendered hypersensitive to an autolysate of *E. rhusiopathiae*. This would suggest that a state of hypersensitivity is not essential for the development of the arthritis. In agglutination tests against *E. rhusiopathiae*, high titers were not always found in the presence of infection. In animals experimentally infected with *E. rhusiopathiae*, focal inflammatory polyarteritis, focal necrosis of liver and myocardium, lymphadenopathy, circulatory monocytosis, and endocarditis were found, but no skin manifestations were ever encountered. Comparisons are made between swine arthritis and chronic arthritis in man." A list is given of 46 references to the literature referred to.

**Studies on Erysipelothrix rhusiopathiae,** P. S. Watts (*Jour. Pathol. and Bact., 50 (1940), No. 2, pp. 355–369*).—The fact that outbreaks of swine erysipelas are usually though not always successfully controlled by the use of immune serum led to a study of the differences between 43 strains of *E. rhusiopathiae* collected from America, Japan, and England and other parts of Europe, with a view to determining if the occasional failures might be due to antigenic differences between strains. It was not possible to separate strains of *E. rhusiopathiae* on the basis of morphological or cultural examination. Of the 43 strains studied serologically, 38 appeared to be of one antigenic type and 5 of another. Of these 5, 3 were from Japan, 1 was from England, and 1 from

America. "There was no correlation between animal host and serological group or between group and virulence. Each group possesses a heat-stable specific antigen. In addition, each probably contains two heat-labile antigens which are present in different proportions in the two groups and are responsible for cross agglutination; they are also the important antigens with regard to resistance to infection. Serums of low potency containing antibodies to these antigens will protect mice against many lethal doses of an organism of the same group but not against a strain from the other group. An intradermal test was used to test active immunization of pigs with a formolized vaccine. In the doses used this vaccine failed completely to protect the pigs against a minimal infecting dose."

**Moderate amounts of lead-arsenate-sprayed apples noninjurious to swine** E. C. McCulloch, J. L. St. John, and K. Groves. (Wash. Expt. Sta.) (*Jour. Amer. Vet. Med. Assoc., 97 (1940), No. 760, pp. 51, 52, fig. 1*).—Experiments in which lead-arsenate-sprayed apples were fed to swine are summarized in table form. The data indicate "that lead-arsenate-sprayed residue, representing 1.47 gr. of arsenic and 3.2 gr. of lead, which are equivalent to the consumption of 7.2 lb. of apples carrying an average residue of 0.205 gr. of arsenic trioxide and 0.445 gr. of lead per pound, fed daily for 140 days to a pig weighing between 101 lb. and 164.5 lb. had no detectable effect. This suggests the possibility that the arsenic and the lead which remain on apples as spray residue are relatively nontoxic."

**Acetonemia in swine,** F. E. Hull and A. F. Nolan. (Ky. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 97 (1940), No. 761, pp. 162–164*).—Report is made of three cases of acetonemia in swine received at the station for diagnosis.

**On the division of the genus Oesophagostomum Molin 1861 into subgenera and the creation of a new genus for the oesophagostomes of the wart-hog,** P. L. Leroux (*Jour. Helminthol., 18 (1940), No. 1, pp. 1–20, figs. 23*).

**Salmonella infections of ducks and ducklings,** J. S. Garside and R. F. Gordon (*Jour. Compar. Pathol. and Ther., 53 (1940), No. 1, pp. 80–89*).—Description is given of an extensive outbreak of salmonellosis in ducklings in which *S. typhimurium* and *S. enteritidis gaertner* were found to be responsible. The history of the outbreak and the symptoms observed closely resemble those recorded by previous writers on this subject and termed by them "Keel" disease. Ducklings up to 4 weeks of age were most susceptible to natural infection. Few losses were experienced after this age or in adult ducks, but a high percentage of carriers of both organisms was demonstrated in the breeding flock by means of the agglutination test. Control measures outlined are described in detail, and with improvement of hygiene and general management on the rearing farm the mortality was successfully reduced from 30 percent to below 3 percent. Attempts to eradicate carriers in the breeding flock by blood testing were unsuccessful, owing to lack of correlated effort on the part of the owners. Breeding experiments carried out at the laboratory and the cultural examination of eggs laid by carrier birds gave negative results. This, together with observations on the course of the disease in the field tends to indicate that egg transmission was not the most important factor in the dissemination of infection, and that adult carriers served only as a possible means of introducing the disease occasionally, in spite of the fact that on post-mortem examination of 68 carrier birds the organisms were successfully isolated from the ovary on 37 occasions. Possibly, as with pullorum disease, such carrier birds lay comparatively few eggs, with a low percentage of infected ones, or none at all. In this, as in other outbreaks of *Salmonella* infection observed, vermin seem to play an important part in appearing to act as natural reservoirs and disseminators of infection.

**Value of repeated testing for pullorum disease,** C. R. Holland (*Md. Agr. Soc., Farm Bur. Fed., Rpt., 24 (1939), pp. 258, 259*).—This includes a summary of pullorum testing work by a chick hatchery at Frederick, Md.

**Limberneck (botulism) in fowls,** A. J. Durant (*Missouri Sta. Cir. 207 (1940), pp. 6, figs. 2*).—A practical account including methods of treatment.

**Grasshopper-poison bait and turkey-poult mortality,** P. D. DeLay (*Jour. Amer. Vet. Med. Assoc., 97 (1940), No. 761, pp. 149, 150*).—This report relates to an investigation of turkey poult mortality following their exposure to improperly spread grasshopper-poison bait. Poults of the same age which were confined and fed a mixture similar to that reported as used in the field died within 12 hr. after exposure.

**A case of pseudotuberculosis in a blackbird,** F. R. Beaudette. (N. J. Expt. Stas.). (*Jour. Amer. Vet. Med. Assoc., 97 (1940), No. 761, pp. 151–157*).—Following a review (with 28 references) in which pseudotuberculosis is shown to be a rather common disease of birds in France and Germany, report is made of a case observed in a blackbird found in a yard in New Brunswick, N. J.

**On wild birds as transmitters of helminth parasites to domestic stock,** P. A. Clapham (*Jour. Helminthol., 18 (1940), No. 1, pp. 39–44*).—Evidence is presented "to show that eggs of helminth parasites are being constantly reintroduced to land and transferred from one pasture to another. In this way land which has not previously carried poultry for years may yet carry viable eggs which can and do infect chickens when they are introduced to such runs. The starling and rook are probably important transmitting agents as these congregate among poultry at feeding times. Rabbits and other small rodents may also be carriers but no evidence for this has been looked for yet. Young poultry stock may also become infected with helminths which are normally parasites of wild birds but such parasites, except one acanthocephalan, have not yet been recovered from or transmitted to older birds experimentally."

**A case of tuberculosis in elk (moose)** [trans. title], Å. Kämpe and T. Hontwedt (*Skand. Vet. Tidskr., 30 (1940), No. 3, pp. 275–279, figs. 2; Eng. abs., p. 279*).—Report is made of a case of tuberculosis in a 4-year-old elk cow shot ir the government district of Örebro in 1939.

**A Salmonella strain isolated from camels in Palestine,** L. Olitzki and V. Ellenbogen (*Jour. Compar. Pathol. and Ther., 53 (1940), No. 1, pp. 75–79*).—Experiments are reported which have demonstrated the presence in Palestine of an infection of camels due to a *Salmonella* strain. This strain was isolated from the blood and organs of three camels showing enteric symptoms and cachexia. The camel strains showed the serological structure of *S. kentucky* described by Edwards (E. S. R., 80, p. 102) but did not attack glycerol and inositol in plain broth. "From 19 sera of camels, 9 contained H- and O-agglutinins for *S. kentucky* and the camel strain, the 10 other sera only O-agglutinins. Four camel sera which contained H- and O-agglutinins for *S. kentucky* and the camel strain contained only O-agglutinins for other *Salmonella* strains. Infection of mice per os with both strains gave a low mortality, but residual infections of the abdominal organs and the mesenteric glands varying from about 20 to 40 percent of the infected animals were found 3 weeks after the infection."

**The hematology of avitaminosis A in dogs and rabbits,** M. W. Emmel (Fla. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 97 (1940), No. 761, pp. 145–148, figs. 2*).

***Listerella* monocytogenesis and its importance in human- and in veterinary-medicine** [trans. title], A. Nyfeldt (*Skand. Vet. Tidskr., 30 (1940), No. 3, pp. 280–285; Eng. abs., pp. 284, 285*).—An historical account is given of the knowledge of *L. monocytogenes*, first observed in necrotic foci in the liver of a

rabbit in Sweden in 1911, which is pathogenic in man, sheep, and other animals. It occasions serious and frequently mortal infections localized in the blood, liver, and central nervous system.

**Allergy in the domestic animals: Survey of (a) factors incidental to domestication probably favouring absorption of native food protein [and] (b) a number of disease conditions possibly associated with sensitisation to food and other proteins,** A. Brownlee (*Jour. Compar. Pathol. and Ther., 53 (1940), No. 1, pp. 55–74*).—In this contribution several diseases met with among the domestic animals have been collated and evidence has been submitted that sensitization to food protein, to tissue protein or metazoan parasite protein may be common to all of these conditions. There is a two-page list of references.

**Case report on botulism type C in minks,** E. R. Quortrup and A. L. Holt (*Jour. Amer. Vet. Med. Assoc., 97 (1940), No. 761, pp. 167, 168*).—Report is made of a disease outbreak of serious proportions that appeared on two mink ranches near Ogden, Utah, and was found to be *Bacillus botulinus* type C intoxication. Botulinus antitoxin is of value for treatment only when used in the early stages of poisoning. The importance of careful selection of food material in preventing botulinus intoxication is emphasized.

**Contribution to our knowledge of parasites in domestic animals and wild in Sweden, II** [trans. title], M. Koffman (*Skand. Vet. Tidskr., 30 (1940), No. 3, pp. 286–366, figs. 71; Eng. abs., pp. 365, 366*).—In this second contribution (E. S. R., 81, p. 838) the author presents a review of the parasites discovered at the State Veterinary-Bacteriological Institute at Stockholm from January to June 1938, inclusive, in the course of examination of material received, which included sheep, swine, cattle, and horse. A description is given of the parasites and their development, together with information on preventive measures taken to combat them. A list of the parasites found is included.

**Haematological studies on the gut contents of certain nematode and trematode parasites,** W. P. Rogers (*Jour. Helminthol., 18 (1940), No. 1, pp. 53–62*).—The examination of *Strongylus edentatus* and *S. vulgaris* has shown that these parasites ingest the hosts' blood and that hematin is the result of the digestion of hemaglobin. The amounts of blood necessary to form the quantities recorded as being present in the parasites' intestines have been calculated. Evidence has been presented to show that the hosts' blood probably forms a large proportion of the diet of fourth stage *S. vulgaris* larvae. A small proportion of the specimens of *Ascaris lumbricoides* examined contained hematin in the intestine. The intestines of most of the specimens of *Toxocara mystax* and *T. canis* investigated contained hematin. Figures are given to show the amounts found. Even immature forms of the former species were found to be blood suckers. *Syngamus trachea* was found to have hematin in its intestine, but no trace of blood pigments could be found in *Oxyuris equi*. Results indicate that the black pigment present in the intestines of *Schistosoma mattheei* and *S. mansoni* was probably hematin formed by the digestion of the hosts' hemaglobin.

**Studies on Coenurus glomeratus,** P. A. Clapham (*Jour. Helminthol., 18 (1940), No. 1, pp. 45–52*).—Studies of the larval stage of the tapeworm *Multiceps glomeratus* reveal that while rabbits and mice are not true vectors of this parasite they are facultative vectors and that the parasite can proceed with its full development in these animals. Infection with *C. glomeratus* of the dog and gerbille was accomplished but not of the cat.

**Sulfanilamide—Merck** (*Rahway, N. J.: Merck & Co. [1939], pp. [2]+14*).—Included in this compilation are data on the solubility, stability, specifications, etc., of sulfanilamide.

## AGRICULTURAL ENGINEERING

**[Agricultural engineering investigations at the New Jersey Stations]** (*New Jersey Stas. Rpt. 1939, pp. 19, 20, 35, 129–132*).—These have included poultry housing—mainly insulation and protective covering for the insulating material; silos and grass silage, under which is noted the much greater lateral pressure exerted by grass than by corn silage; studies of temperatures in grass silage, in which it was found that a preservative is necessary and that molasses and phosphoric acid serve this purpose well; farm buildings plan service; and a mechanical blueberry fertilizer distributor, consisting of a combination of an "endgate" centrifugal distributor and a positive feed from a potato planter.

Under sewage treatment are taken up principles underlying activated sludge process ((1) clarification and (2) enzymes), methods, methane-producing organisms, growth-promoting substances, sewage-clarifying organisms, and properties of hydrated lime. Water treatment and stream pollution are also reported upon.

**Water control investigations [at the Florida Station]**, B. S. Clayton and J. R. Neller. (Coop. U. S. D. A.). (*Florida Sta. Rpt. 1939, pp. 156, 157*).—Pumping records, work on water-table plats, evaporation studies, subsidence investigations, and the keeping of automatic water-table variation records are noted under this head.

**Soil and erosion changes on the Dalhart sand dune area**, L. K. Esry and C. J. Whitfield. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 4, pp. 290–296, figs. 5*).—The area discussed consists of about 2,000 acres in which dune formation and other effects of wind erosion are believed to have originated on an 80-acre field cultivated from 1907 to 1914 and then grazed, the remainder of the area never having been under cultivation. Treatment consisted in listing the bare subsoils exposed between the dunes and in planting suitable vegetation about the dunes to catch and hold sand blown from their tops. It is indicated that, "although these medium textured to sandy soils have suffered from extreme wind erosion, the treatment applied has sufficiently modified their physical condition so that their productive capacity very nearly equals the productive capacity prior to accelerated wind erosion."

**The permeability of building papers to water vapour**, J. D. Babbitt (*Canad. Jour. Res., 18 (1940), No. 5, Sect. A, pp. 90–97*).—Various types of building papers roughly grouped into 13 classes were tested as to their permeability to water vapor. It is apparent that a continuous film of some impermeable material, such as wax or asphalt, is necessary if the paper is to be impervious to water vapor, while the presence of the impermeable material as an absorbed phase in the paper is not sufficient. Evidence from this study indicates that diffusance is independent of such factors as thickness, weight, or type of paper.

**Methods of ventilating wheat in farm storages**, C. F. Kelly (*U. S. Dept. Agr. Cir. 544 (1940), pp. 74, figs. 37*).—Under typical temperature conditions, low moisture content was found the most important requirement for safe storage, design and materials of the storage structure being of little importance except in their effect on moisture content and temperature. Experiments further indicated that sound wheat can be stored safely in unventilated bins for 1-yr. periods in western Kansas with from 13 to 13.5 percent of moisture, in Illinois and Maryland with from 13.5 to 14 percent of moisture, and in North Dakota with from 14 to 14.5 percent of moisture. The higher moisture content permissible in North Dakota is due primarily to the lower temperatures.

Bins ventilated with suitable horizontal flues ordinarily are safe for storing wheat with initial moistures 1 percent higher than would be safe in nonventilated bins. The cost of material for such flues spaced 18 in. on centers horizontally

and 24 in. vertically is from 6 to 8 ct. per bushel, of bin capacity. Since they can be made easily removable they are not as much of a nuisance as they may seem. They must be provided with hoods to shed rain and stoppers to close the flues tightly to keep out driving snow and humid air or to hold fumigation gases. Closely spaced flues with pressure and suction cowls, which can be made still more efficient, are also discussed. These should be safe for storing wheat of 2 percent more moisture than is safe in unventilated bins. The cost of material for such a system will range between 15 and 25 ct. per bushel, being lower for the larger bins. Other types of ventilation using power will ordinarily be more economical. Vertical flues did not prove as effective as horizontal flues with similar spacing.

Bins having perforated floors were effective for equalizing the moisture content of wet and dry layers, but removed little moisture from the content of the bin as a whole except when the ventilation efficiency was increased by adding a suction cowl on the roof of the bin and tightly closing all openings above the wheat. In western Kansas such bins may be safe for wheat of 1.5 percent higher moisture content than in nonventilated bins, but their effectiveness in regions of high humidity is limited. In the drier areas the efficiency of a bottom-ventilated bin can be further increased to take care of wheat of higher moisture content by forcing air in either direction through the wheat by means of a grain blower, silo-filler blower, or any other heavy-duty fan that may be available. Because of the uneven drying resulting from power ventilating such a bin, ventilating should be continued until the layers of wheat farthest from the inlet have dried to a safe moisture content. For more efficient drying by power ventilation, means should be provided so that the air need not flow through the full depth of wheat, as by the use of a central pressure chamber, perforated floor, and perforated walls. With a blower of adequate capacity and a few hours of reasonably dry weather each day, such a system should dry wheat of 18 percent moisture content without damage. Quicker and more even drying can be obtained by use of ducts instead of the central air chamber.

## AGRICULTURAL ECONOMICS

**[Investigations in agricultural economics by the Mississippi Station]** (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 6, pp. 1, 7, 8*).—Included are the following articles, which are part of the director's annual report: Farm Buying Distributed Three Ways, by A. Bowie, giving findings in the study of purchases and place of purchase of 74 farms families during 1939; and Growers of Starch Potatoes Do Well in Jones County Area, by M. Guin, D. W. Parvin, and J. Huff, on farm receipts, expenses, income, etc., on two groups of farms in Jones County, one of which grew sweetpotatoes for sale to a starch factory and one did not.

**[Investigations in agricultural economics by the New Jersey Stations, 1938–39].** (Partly coop. U. S. D. A.). (*New Jersey Stas. Rpt. 1939, pp. 10–18*).—Some data are included as to yields, costs per bushel, prices received, markets, etc., for apples in Sussex and Warren Counties, 1934 and 1936, as shown by the reports of 10 growers, and factors affecting costs, prices, and profits from tomato production in 1938.

**Ohio agricultural statistics, 1938,** G. S. Ray, O. M. Frost, and P. P. Wallrabenstein. (Coop. U. S. D. A.). (*Ohio Sta. Bul. 612 (1940), pp. [1]+64, fig. 1*).—The bulletin continues the series (E. S. R., 81, p. 727). Tables show (1) by counties and districts for the years 1937 and 1938 (preliminary) the acreages, yield per acre, and production of different crops, and for January 1,

1938 and 1939, the numbers of different kinds of livestock: (2) for the State by years 1924–38, inclusive, the acreages, yield per acre, production, season average price, and farm value of different crops, and on January 1, 1925–39, the number, value per head, and total value of different kinds of livestock and livestock products; (3) State average monthly prices received by farmers 1934–38 for crops and livestock; and (4) by districts for the State or by districts by years or quarter years data as to eggs produced per 100 hens, farm wages, farm labor supply and demand, prices received by farmers, estimated gross cash income from sale of agricultural products, and Government payments.

**[Investigations in agricultural economics by the Puerto Rico College Station, 1938–39]** (*Puerto Rico Col. Sta. Rpt. 1939, pp. 26–37, figs. 3*).—Data are included as to the receipts, expenses, farm and labor incomes, etc., on 270 tobacco farms studied in 1937–38, by R. Colon Torres, and on 90 small farms averaging about 25 acres, studied by E. del Toro, Jr., D. Haddock, and J. O. Morales (pp. 26–29); earnings on about 150 coffee farms, studied by del Toro, Jr., Haddock, and M. Hernández (pp. 29–31); studies of coffee and raw sugar prices, by J. J. Serralés, Jr., and M. Vélez, Jr. (p. 32); studies, by S. Díaz Pacheco and J. R. Noguera, of the per capita consumption of different foods by different income groups in 22 towns, of retail agencies selling minor crops, and of home tenure and rental payments in 1938 (pp. 34–37).

**Current Farm Economics, [June 1940]** (*Oklahoma Sta., Cur. Farm Econ., 13 (1940), No. 3, pp. 49–76, figs. 2*).—Besides the usual tables, these articles are included: The Agricultural Situation (pp. 51–57); Oklahoma's Experience With Graduated Land Tax Legislation, by R. T. Klemme (pp. 57–59); Quality of Cotton Produced in Oklahoma Crop of 1939–1940, by K. C. Davis (pp. 60–66); Land-Use Planning in Oklahoma, by H. A. Miles (pp. 67–70); and Salaries of Managers in Cooperative Elevators, by A. L. Larson (pp. 71–73).

**Levels of training for service in agricultural economics, R. J. Saville** (*Louisiana Sta., 1940, M–M 1, pp. II+20*).—Tables are included and discussed showing the academic training; distribution as to services—teaching, extension, and research; load; training for heads of departments; etc., of workers in agricultural economics in the land-grant colleges and universities in the United States.

**Farm accountancy statistics for 1936–37, U. Papi** (*Inst. Internatl. Agr. [Roma], Comptab. Agr. Rec. Statis., 1936–37, pp. XIX+93*).—This is the ninth volume of the series (E. S. R., 82, p. 412).

**Rural regions of the United States, A. R. Mangus** (*Washington: Work Proj. Admin., 1940, pp. IX+230, figs. 17*).—This report "provides a geographic background for analyses of the problems of relief and unemployment. . . . On the basis of carefully selected cultural indices, the counties of the United States have been classified into 218 rural-farm subregions. These in turn have been combined into 32 general rural-farm regions. Taking into account the characteristics of the rural-nonfarm population as well as of the rural-farm population, 264 rural subregions have been delineated and combined into 34 general rural regions." The different regions and subregions and the delineation and selection of sample counties representative of regions and subregions are described and discussed.

**Agricultural production and types of farming in Minnesota, S. A. Engene and G. A. Pond.** (Coop. U. S. D. A.). (*Minnesota Sta. Bul. 347 (1940), pp. 70, figs. 71*).—"The purposes of this bulletin are (1) to describe the important factors affecting agricultural production in Minnesota, (2) to present a factual picture of the agricultural production patterns in the State that have resulted from the operations of these factors, and (3) to delineate and describe the more or less

distinct type-of-farming areas in the State at the present time." The material, so far as possible, is presented graphically. The natural, economic, and social factors affecting agricultural production, the agricultural development, utilization of land in farms, distribution of livestock, etc., are covered. The State is divided into nine type-of-farming areas, and the cropping systems, livestock production, and types of farming for each area are discussed, and tables included presenting data as to size of farms, value of land, tenure, and value of products, etc., for different types of farms.

**Statistical supplement: Agricultural production and types of farming in Minnesota,** S. A. ENGENE and G. A. POND. (Coop. U. S. D. A.). (*Minnesota Sta. Bul. 347 (1940), Sup., [pp. 25], fig. 1*).—This supplement to the bulletin noted above includes data by counties grouped by type-of-farming areas.

**Rural rehabilitation progress in Stearns County, Minnesota.—I, A summary analysis,** W. R. BAILEY. (Coop. Minn. Expt. Sta. et al.). (*U. S. Dept. Agr., Bur. Agr. Econ., Farm Mangt. Rpt. 3 (1940), pp. [2]+31*).—The causes of distress in the county, previous income of Farm Security Administration clients, their resources, the use made of borrowed funds, progress made by clients, fitting plans to clients' needs, supervision, etc., are discussed.

**An economic study of farming in Tompkins County, New York, 1937,** P. A. HENDERSON (*[New York] Cornell Sta. Bul. 728 (1940), pp. 65, fig. 1*).—This bulletin is based on records for 544 farms for the year ended March 31, 1938, obtained by the survey method. In the analysis the farms were grouped on the basis of type of market for milk. The climate, physical features, price conditions, etc., of the county are described. Analysis is made of the costs of operating trucks and tractors, use of land, crops, livestock, farm capital, value of farm privileges, receipts, expenses, income, etc., and of the factors affecting labor income—type of farming, size of business, rates of production, diversity of business, labor efficiency, and land use. An arbitrary standard for a successful farm is outlined.

Size of business, milk production per cow, crop yields, and labor efficiency were the most important factors affecting labor income. The labor incomes for the different types of farms (382 farms) with none of the 4 factors above the average and with all 4 factors above the average were Grade A milk farms —$194 and $1,493, Grade B milk farms —$532 and $624, and other dairy farms —$389 and $176. The average labor incomes for all farms in the study were Grade A milk farms $407, Grade B milk farms —$28, and other dairy farms —$150; poultry farms $282; and miscellaneous type of farms $29.

**Operation of agricultural conservation programs in Illinois,** G. E. TOBEN and H. C. M. CASE. (Coop. Ill. Expt. Sta.). (*U. S. Dept. Agr., Bur. Agr. Econ. and Agr. Adjust. Admin., Farm Mangt. Rpt. 4 (1940), pp. [1]+8*).—This is a digest of the manuscript for a detailed report, the basic data for which were obtained from 507 nonselected farms in and adjoining Gridley Township, McLean County, Wethersfield Township, Henry County, and Pin Oak Township, Madison County. The major emphasis is on the 1938 Agricultural Adjustment program.

**Farm operating efficiency investigations in Virginia, 1931–1938: Progress report,** A. T. HOLMAN, J. L. MAXTON, and G. D. KITE (*U. S. Dept. Agr., Bur. Agr. Chem. and Engin., and Va. Polytech. Inst., 1940, ACE-29, pp. 57, pls. 12, figs. 20*).—This study was made to determine practical means and methods whereby land, farm improvements, power, machinery, labor, farm enterprises, and marketing of products can be brought into balance for most efficient operation of the farm. Seventeen typical dairy, beef, truck, fruit, and general farms in the Coastal Plain, Piedmont area, and Shenandoah Valley and 8 in southwestern Virginia were studied. The areas, farm development, crops, livestock,

labor efficiency, power, farm equipment, finances, and living conditions are discussed.

**Organization and crop production practices on grain farms in selected areas of the northern Great Plains,** R. S. Washburn (*U. S. Dept. Agr., Bur. Agr. Econ., Farm Mangt. Rpt. 2 (1939), pp. [3]+94, figs. 17*).—This report deals with the major wheat-producing areas of the northern Great Plains and "discusses (1) the physical and economic factors affecting agricultural production in the region; (2) wheat yields and frequency of damage to wheat from different causes; (3) the farm organization from the standpoint of size of farm, livestock kept, and the place of the different crops in the cropping system; (4) the practices employed in the production of different crops; (5) the duty of farm machinery; and (6) the labor and power involved in the production of crops."

**Agricultural labor requirements and supply: Kern County,** R. L. Adams (*California Sta. Mimeog. Rpt. 70 (1940), pp. [1]+20, figs. 4*).—This report supplements Bulletin 623 (E. S. R., 80, p. 262), and deals more exhaustively with the labor requirements for the 20 major crops grown in Kern County.

**Report of the Committee of Enquiry Into Land Settlement** (*London: Govt., 1939, pp. VI+158*).—This is the report of the committee appointed "to inquire into the working of the various schemes of land settlement for unemployed men undertaken in England and Wales since November 1934 by the Land Settlement Association, the Welsh Land Settlement Society and County Councils." A general description of the land settlement schemes and the committee's findings are included.

**Farm leases for Illinois, including father-son agreements,** H. C. M. Case and J. Ackerman (*Illinois Sta. Cir. 503 (1940), pp. 55, figs. 3*).—This circular supersedes that previously noted (E. S. R., 78, p. 122). It discusses four types of leases commonly used in the State, father-son agreements, leases used in the Corn and Wheat Belts, the major problems needing adjustments in leasing in the State, and tenant-landlord contributions under different forms of leases.

**Rural property tax problems in Alabama,** C. M. Clark (*Alabama Sta. Bul. 247 (1940), pp. 64, figs. 7*).—The long-time trends and regional variations in rural property taxes in the State; the relation of taxes to farm prices, purchasing power of farm products, rural real estate values, and farm receipts, expenses, and income; the extent of rural real estate tax delinquency and the factors associated with it; the extent of sales of rural property for taxes and the factors associated with such sales; and the assessments of farm property for taxes are analyzed and discussed.

Assessed valuation and taxes per acre rose from $2.97 and 0.6 ct. in 1849 to $9.76 and 20.8 ct. in 1929 and then dropped to $7.42 and 14.9 ct. in 1934 and 1935. From 1931 to 1935 the purchasing power of farm products has been only from 49 to 79 percent of that during the period 1910–14. In 1932 approximately 60,000 rural properties, including more than one-third of the land of the State, were delinquent. Over 75 percent of the properties delinquent were from 20 to 174 acres in size. The sales of rural real estate property taxes increased from 570 pieces involving 71,470 acres in 1928 to approximately 6,700 pieces involving 1,126,310 acres in 1932. The indexes (1910 equals 100 percent) of rural real estate, urban real estate, public utility, and personal property assessed values in the period 1881–90 were 48, 23, 24, and 34; in 1911–20, 151, 122, 107, and 118; and 1921–30, 212, 160, 153, and 164. The assessed valuation of farm real estate and taxes per $100 of farm value for different counties ranged from 16 to 87 percent and from 67 ct. to $1.27. In 5 counties of the State the percentages of assessed value of farm value for different sized farms with different values were: Less than 50 acres, value less than $2,100, 39 percent, value over

$2,699, 26 percent: 50 to 99 acres, value less than $3,100, 38 percent, value over $4,499, 29 percent; 100 to 149 acres, value less than $4,200, 41 percent, over $6,299, 29 percent; 150 to 199 acres, value less than $5,400, 40 percent, value over $8,299, 30 percent; and 200 acres or more, value less than $8,400, 38 percent, value over $14,999, 34 percent.

**Income parity for agriculture.—V, Population, farms, and farmers: Sect. 1, Farm population, nonfarm population, and number of farms in the United States, 1910–39,** E. W. Grove (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Adjust. Admin., and Bur. Home Econ., 1939, pt. 5, sect. 1, pp. [2]+II+39, figs. 7*).—This preliminary report includes a table showing the farm population, nonfarm population, and number of farms by years, 1910–39, and a table and chart showing the indexes for each year, and describes the data and methods followed in making the estimates.

**Receipts and expenditures of rural New York counties,** O. H. White (*[New York] Cornell Sta. Bul. 729 (1940), pp. 75, figs. 2*).—The development and variations in county government in the State and the general and financial administration of county government are described and discussed. An analysis is made of the receipts and expenditures, 1936 and 1937, in 49 counties with populations less than 150,000 and of the indebtedness of counties of the State for different lengths of time.

The total income for the 49 counties in 1937 was approximately $1,000,000, of which nearly 60 percent came from property taxes, 35 percent from State and Federal aid or State-shared revenues, and the remainder from departmental earnings, refunds, etc. The expenditures averaged slightly over $1,000,000, of which approximately 38 percent was for welfare, 30 percent for highways, 11 percent for debt service, 8 percent for protection, and 9 percent for general government. As the population increased average receipts and expenditures increased, expenditures per capita decreased, relatively welfare costs became more important and highway costs less important, and the percentage of expenditures financed from sources other than property taxes decreased. Most of the rural counties were not heavily bonded. Per capita indebtedness decreased with population in the counties with less than 100,000 population and increased in the counties with larger population.

**Nevada farm prices, 1910–1939, and a Nevada farm price index,** C. Venstrom. (Coop. U. S. D. A.). (*Farm Mangt. Bul. [Nev. Sta.], 1 (1940), No. 1, pp. [1]+43, figs. 4*).—Included are monthly and annual price indexes, usually for the period 1910–39, for beef cattle, lambs, wool, sheep, butterfat, hogs, eggs, chickens, calves, alfalfa hay, wheat, barley, potatoes, and all farm prices, and annual group indexes for range livestock (beef cattle, sheep, and all range livestock) and general farm products (livestock and livestock products, crops, and all products). The 13 commodities represent 95.6 percent of the agricultural income from farm production. The index is of the weighted aggregative type with 1910–14 as the base period. The base period prices are weighted by average quantity of products marked 1924–33. No correction is made for seasonal variations in prices.

**Statistical analysis of the annual average f. o. b. prices of canned clingstone peaches, 1924–25 to 1939–40,** H. R. Wellman (*California Sta. Mimeog. Rpt. 71 (1940), pp. [1]+11, figs. 2*).—An analysis is made of the relationship from 1924–25 through 1939–40 between f. o. b. prices of canned clingstone peaches and three major factors influencing such prices. On an average a change of 1,000,000 cases in domestic shipments of canned peaches was accompanied by a change in the opposite direction of 15 ct. per case in the price of canned clingstone peaches, a change of 10 points in the index of nonagricultural income in the United States was accompanied by a 47 ct. change in price in

the same direction, and a change of 10 points in the prices of competing canned fruits was accompanied by a change of 25 ct. in price in the same direction.

**Food, feed, and southern farms: A study of production in relation to farm needs in the South,** O. Steanson and E. L. Langsford (*U. S. Dept. Agr., Bur. Agr. Econ., Farm Mangt. Rpt. 1 (1939), pp. [2]+25*).—The amounts of farm-grown feed needed and used and the quantities of livestock, cropland, and pasture in 1937, and the amounts needed to supply specified diets are analyzed and discussed.

**Determining input-output relationships in milk production,** E. Jensen (*U. S. Dept. Agr., Bur. Agr. Econ., Farm Mangt. Rpt. 5 (1940), pp. [1]+12, figs. 3*).—Preliminary results of a study made in cooperation with 10 agricultural experiment stations of feed input and milk output are reported.

**Should net-weight trading and standards for tare be adopted for American cotton?** J. W. Wright (*U. S. Dept. Agr., Agr. Market. Serv., 1939, pp. [2]+21*).—Information is presented in question and answer form.

**Grade, staple length, and tenderability of cotton in the United States, 1938–39.** (*Coop. Ariz., Calif., Ga., N. C., Okla., S. C., and Tenn. Expt. Stas. and partly coop. Ala., Ark., Fla., La., Miss., Mo., N. Mex., and Tex. Stas.*). (*U. S. Dept. Agr., Agr. Market. Serv., 1940, pp. [4]+70, figs. 10*).—This publication continues the series previously noted (E. S. R., 80, p. 553). Tables are included for the first time showing by States by years, 1933–38, the preparation for ginning of different staple lengths prior to October, during October and November, December 1–January 15, and after January 15.

**Report of the Chief of the Sugar Division, 1939,** J. Bernhardt (*U. S. Dept. Agr., Sugar Div. Rpt., 1939, pp. 19*).—This report for the year ended June 30, 1939, is presented under the headings Sugar Act of 1937, effect of program on income of domestic producers, position of consumers under sugar program, administration of sugar quota provisions, sugar marketing allotments, administration of conditional payment programs, and finances for the sugar program.

**Cost of production and grove organization studies of Florida citrus,** Z. Savage and C. V. Noble (*Florida Sta. Rpt. 1939, pp. 36, 38*).—A table shows the average costs of production, returns, profits, amounts of fertilizers used, etc., on 12- to 14-year-old late orange groves studied.

**Proceedings of the annual meeting of the New England Research Council on Marketing and Food Supply held on April 24 and 25, 1940, at Boston, Massachusetts** (*Boston: New England Res. Council Marketing and Food Supply, 1940, pp. 1–30, 33–53, 57–73, figs. 6*).—Included are committee reports and the following papers with discussions presented at the meeting held at Boston April 24 and 25, 1940: An Appraisal and Evaluation of Research in New England Now Under Way or Recently Completed, by F. Griffee (pp. 1–24); The New England Milk Marketing Study—Review of Work Completed and Present Status of the Country [Dairy] Plant Study, by R. G. Bressler, Jr. (pp. 25–28) (Univ. Conn.); The New England Milk Marketing Study—Plans for Preparation of a Report on the Supply Side of New England Milk Markets, by A. MacLeod (pp. 29, 30); The New England Milk Marketing Study—Should the Emphasis of the New England Milk Marketing Research Program be Changed? by H. B. Rowe (pp. 33–36); Report of a Study on Consumer Preferences for Potatoes in the Boston Market.—I, Sampling Procedure Used in the Study of Consumer Preferences for Maine Potatoes in Part of the Metropolitan Boston Area, by M. A. Hincks (pp. 37–53) (Maine Expt. Sta.); The Use of Agricultural Surpluses to Overcome Nutritional Deficits, by A. C. Hoffman (pp. 57–67) and The Marketing Research Program of the Bureau of Agricultural Economics and Its Relationship to the Work of the Experiment Stations, by H. R. Tolley (pp. 71–73) (both U. S. D. A.).

**The organization and management of 95 dairy and cash crop farms in Androscoggin and Oxford Counties, Maine,** A. E. Watson and E. Rauchenstein. (Coop. U. S. D. A.). (*Maine Sta. Bul. 398 (1940), pp. [4]+72, figs. 5*).—Data for the year ended April 30, 1937, were obtained by interviews. The area and farms studied are described and data included as to size and value of farms, crops, livestock, value of buildings, farm capital, sources of income, expenses, farm and labor incomes, returns on capital, etc. An analysis is made of the effects on labor income of size of business, production rates, labor efficiency, combination of enterprises, fertility practices, and man labor. The use of farm power, the dairy enterprise, history of operators, family living obtained from the farms, types of farming, etc., are discussed.

The average size of farms was 180 acres. The average dairy herd consisted of 9 cows, 2.8 heifers 1 yr. old or over, and 1.7 heifers less than 1 yr. old. The average receipts were $1,976, of which 45.1 percent was from dairying, 24.4 from crop sales, 11.8 from livestock products other than dairy, 5.8 from forest products, and 12.9 percent from miscellaneous sources. The average labor income was $87. Labor income increased from —$50 where less than 32 acres were cropped to $137 with 52 acres or more cropped, from —$33 with herds of less than 6 cows to $68 with herds of 10 cows or more, from —$116 with less than 260 man-work units per farm to $314 with 400 or more units, from —$192 for herds producing less than 4,300 lb. of milk per cow to $304 for those producing 5,800 lb. or over, from —$108 where the crop index was less than 90 to $282 where it was 110 or higher, and from —$23 where there were less than 7 animal units per man to $134 with 10 or over units per man. Combination of enterprises and increased use of fertilizers and lime increased labor income, which decreased from $396 where less than 33 percent of the total receipts were dairy products to —$198 where 53 percent or more were from that source. The average annual cost per cow for labor was $34.55, of which $12.16 was during the pasture season. The average cost per 100 lb. of 4-percent milk for feed and man labor was $1.99, varying from $2.51 for low-producing herds (less than 4,300 lb.) to $1.66 for higher-producing herds (5,800 lb. and over). The average value of products produced on the farms and consumed by the farm families was $235.

**Crops and Markets, [May–June 1940]** (*U. S. Dept. Agr., Crops and Markets, 17 (1940), Nos. 5, pp. 93–108, fig. 1; 6. pp. 109–128, fig. 1*).—Included are crop and market reports of the usual types (E. S. R., 83, p. 556) for May (No. 5) and June (No. 6), 1940.

**The first world agricultural census (1930), I–V,** A. Brizi (*Roma: Internatl. Inst. Agr., 1939, vols. 1, pp. 267; 2, pp. 493; 3, pp. 590; 4, pp. 505; 5, pp. 479*).—Volume 1 describes and discusses the standard form proposed and documents relating to its preparation, a methodological study of the questions contained in the forms, and notes on the tabulation of the census results. Volumes 2 to 5 include the data obtained from different countries as follows: Volume 2, Austria, Belgium, Czechoslovakia, Denmark, Estonia, Finland, and France; volume 3, Germany, Greece, Irish Free State, Italy, Latvia, Lithuania, Netherlands, Norway, Spain, Sweden, Switzerland, and United Kingdom; volume 4, Canada, United States (including outlying territories and possessions), Mexico, Argentina, Chile, Peru, and Uruguay; and volume 5, India, Japan, Algeria, Egypt, French West Africa, Kenya, Mauritius, Mozambique, Union of South Africa, Australia, and New Zealand. The data for most of the countries have been previously noted (E. S. R., 79, p. 703).

**The world agricultural situation in 1938–39** (*Roma: Internatl. Inst. Agr., 1940, pp. [VII]+373, figs. 34*).—The general economic background of the agricultural situation, international economic relations, the production and supply

of and world trade in agricultural products, and the agricultural policies of different countries are described and discussed.

**World trade in agricultural products: Its growth, its crisis, and the new trade policies,** L. B. Bacon and F. C. Schloemer (*Roma: Internatl. Inst. Agr., 1940, pp. XIX+1102*).—Part 1 (pp. 1–514) deals with the market developments on a world-wide scale for wheat, rice, sugar, meat, fats and oils, coffee, tea, tobacco, cotton, wool, silk, and rubber, and the dispersion and divergencies in movements of volumes and prices for the different commodities. Part 2 (pp. 515–1102) deals with the national policies affecting external trade in farm commodities in the United Kingdom, Germany, France and her overseas possessions, Italy, Netherlands, Denmark, Rumania, Hungary, Yugoslavia, Bulgaria, U. S. S. R., the United States, Argentina, Australia, Canada, and Asiatic exporters of agricultural products, and divergencies among national developments.

**Olives and olive products: Production and trade,** U. Papi (*Internatl. Inst. Agr. [Roma], Studies Princ. Agr. Prod. World Market, No. 6 (1940), pp. [5]+223, pls. 19*).—Continuing the series (E. S. R., 81, p. 727) on principal agricultural products on the world market, the area in olive trees, number of trees, production for oil extraction and for table use, production of edible and nonedible oil, world trade in olive oil and table olives, etc., are discussed for each of the 27 countries in which olives are cultivated.

**Almond production abroad: Statistics, technique, and economics,** R. L. Adams (*Sacramento: Calif. Almond Growers Exch., 1939, pp. V+74, figs. 23*).—Almond production in Italy, France, Spain, northern Africa, Greece, and Portugal is discussed, special attention being given to the economics of almond growing in Italy and France.

**Cooperative egg and poultry auction associations,** J. J. Scanlan and R. W. Lennartson (*Farm Credit Admin. [U. S.], Coop. Res. and Serv. Div., Bul. 37 (1939), pp. VI+101, figs. 27*).—This is a general and nontechnical discussion of egg and poultry auction associations. The development of such associations, types of organization, methods of operating, operating results, and the conditions favorable to the success of such associations are discussed. Appendixes include a list showing the location of the associations studied and the marketing rules of the Bucks County, Pa., Producers' Cooperative Association.

**Cooperative creamery accounting,** D. D. Brubaker (*Farm Credit Admin. [U. S.], Coop. Res. and Serv. Div., Bul. 39 (1939), pp. IV+99, figs. 4*).—Accounting forms and procedure, their installation by an operating association, the procedure for a new association, and producers' and producer-settlement records are described and discussed. Copies of different forms and records are included.

**Cooperative purchasing by Indiana farmers,** G. M. Francis (*Farm Credit Admin. [U. S.], Coop. Res. and Serv. Div., Bul. 38 (1939), pp. VI+84, figs. 18*).—The development of farm bureau purchasing cooperatives in the State and the organization structure and status of county associations are discussed. An analysis is made of the operating methods and financial and operating conditions in 1934 and 1937 of 30 selected county associations.

**Bulk handling in Australia,** J. S. Davis (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 16 (1940), No. 7, pp. [2]+301–364, figs. 9*).—Country and terminal grain elevators had been long discussed but never introduced in Australia before New South Wales, in 1916, provided for a state system. Opened for partial use in 1920–21, this system was slow to find favor with farmers, merchants, and millers; and for 10 yr. other states were content to observe the operating and financial experience in the pioneer state. In 1930–31, ocean

freight differentials in favor of bulk wheat were established, and bulk shipment oversea soon became the rule. With this change, bulk handling within Australia has expanded materially. The New South Wales plant has been extended, is more widely used, and yields operating surpluses, but has been cursed by recurring congestion. In Western Australia, progressive farmers' cooperatives have developed a cheaper, more flexible, unorthodox system which has worked well. Since early in 1936, when this received delayed official sanction, it has expanded rapidly despite poor terminal facilities and grudging cooperation from the state railways. Bag handling and storage, however, still have a large place in Australian practice and may long persist in some degree. This year, as in 1916, Australia faces the task of dealing with a bumper crop under conditions that severely restrict exports.

## RURAL SOCIOLOGY

**Rebuilding American community life,** C. P. LOOMIS. (U. S. D. A.). (*Amer. Sociol. Rev., 5 (1940), No. 3, pp. 311–324, fig. 1*).—The author concludes that planned revitalizing of community life must take into consideration the cultural backgrounds of the people involved. Existing cultural traits or processes should be used where possible in the nurturing of community development. "Governmental action and planning agencies should, where possible, make local communities functional units. If communities are disregarded by action agencies dealing with local people, support for these programs will not be on as permanent a basis as if the community were made the center of planning and administration. If communities are not now sufficiently vocal and powerful to demand a place in administration and planning, disregarding them will certainly not strengthen them. To revitalize community life, existing communities should be made functional units in constructive programs."

**Basic trends of social change in South Dakota.—VI, Education in transition,** W. F. KUMLIEN (*South Dakota Sta. Bul. 338 (1940), pp. 47, figs. 22*).—This is one of the series previously noted (E. S. R., 83, p. 558). Following are some of the trends noted: Elementary school enrollments are decreasing and high school and college enrollments are increasing, as was the proportion of persons of school age actually attending school. Both the compulsory school age and attendance requirements have been raised. School costs have risen not only with increased attendance but also with increased demand for educational services and facilities. Centralization results in fewer but better schools, and the qualifications of teachers have been raised progressively. There is a tendency toward more practical curricula, for example, vocational courses on a secondary school and college level.

**The construction and standardization of a scale for the measurement of the socio-economic status of Oklahoma farm families,** W. H. SEWELL (*Oklahoma Sta. Tech. Bul. 9 (1940), pp. 88, figs. 2*).—"The purpose of the study was to construct and standardize a simple scale that would give quantitative expression to the nature and extent of the variations existing in the socio-economic status of Oklahoma farm families."

**The theory and consequences of mobility of farm population,** O. D. DUNCAN (*Oklahoma Sta. Cir. 88 (1940), pp. 22*).—The author concludes that a high degree of mobility brings together conflicting points of view and dislodges vested interests. There is no surer index of subjugation and servility of the masses of human beings than absolute fixity of place and social condition. While there are thought to be no new continents to be discovered, it remains that new frontiers must be discovered if a large portion of the present popu-

lation of this country is not to die without issue. Perhaps migration holds the solution for the present debacle, but who knows?

**Distribution and extent of unemployment among farm laborers in the United States,** L. Nelson. (Univ. Minn.). (*Social Forces, 18 (1939), No. 2, pp. 180–187, figs. 2*).—The author shows that the supply of agricultural wage workers in November 1937 totaled approximately 3,222,000 persons. Adjustment by 30 percent for under-registration gives a figure of 3,439,500. There is reason to believe, however, that the available supply would be higher, perhaps approximating 4,000,000 workers during periods of peak agricultural activity. Approximately three-quarters of a million wage workers registered as totally unemployed or on emergency work in November of 1937. The unemployment rate was higher than the average for the United States in the small grain, middle eastern, and the cotton farming areas, while the lowest rates were in California and Florida, corn and dairy areas. The rates in the range and northwestern areas were slightly lower than for the country as a whole. Emergency work opportunities apparently were irregularly distributed by regions, with some tendency toward higher percentages being on work projects in areas of least unemployment.

**Economic aspects of remedial measures designed to meet the problems of displaced farm laborers,** M. R. Benedict. (Univ. Calif.). (*Rural Sociol., 5 (1940), No. 2, pp. 163–182*).—"The problem of the agricultural migrant lies only partly in the realm of agriculture. Much of the distress of recent years has resulted from a decrease in urban employment which in earlier periods absorbed large numbers of workers of rural origin. The bad effects of these tendencies have been increased by rapid mechanization and drought in the farm areas. The problem is likely to increase in the years just ahead. The numbers now seeking a living on the land cannot be absorbed as agricultural entrepreneurs and workers except by vast changes in the structure of the agricultural economy. Tenant-purchase and the breakup of large holdings offer only limited possibilities. Cooperative farming does not provide an adequate solution. Improved tenancy legislation would help. Publicly sponsored development of small industries along the lines of the British Trading Estates program might provide substantial betterment in some areas."

**Private and public costs of isolated settlement in the cut-over area of Minnesota,** J. E. Mason. (U. S. D. A.). (*Rural Sociol., 5 (1940), No. 2, pp. 206–221*).—"Private costs of isolated settlement appear as inconveniences and hardships resulting from poor roads and poorly equipped homes, lack of social contacts, and direct money outlays for snow plowing and transfer of products to or supplies from the markets. Distances to neighbors, grocery stores, doctors, churches, schools or school bus routes, shipping points, and to all-weather roads are translated into high costs both to the taxpayers forced to foot the bills for public services and to the individual settler who must bear the costs in the conduct of normal, everyday activities. Paramount in the public costs of isolated settlement are the expenditures for roads and schools. Other public costs, though difficult of measurement in dollars and cents, include extra costs incurred by the county nurse, county agent, and teachers of vocational agriculture when they must visit remote places in the performance of their duties; also election and assessment costs, rural mail delivery, administration of game and other laws, and forest fire protection costs are increased as a result of scattered, isolated settlement. The results of this study indicate that public costs are sufficiently excessive to justify relocation; and when all the disadvantages of isolated settlement are considered, a program of some sort seems not only necessary but imperative."

**Trends in community organization and life, T. L. Smith.** (La. State Univ.). (*Amer. Sociol. Rev., 5 (1940), No. 3, pp. 325–334*) —It is concluded that "the locality-group structure of society is undergoing a rapid transformation. The future promises a social structure in which the horizon of the individual family is greatly extended, and its relations with locality groupings are much wider and more complex than in the past. Group cohesion seems likely to be based even more on conscious recognition of mutual interdependence; social conflict promises to be more prevalent but more intermittent and less deep-seated; and mutual aid is likely to give away still more to cooperation of the contractual type."

**Problems of farm youth—a point of view, P. H. Landis.** (Wash. State Col.). (*Social Forces, 18 (1940), No. 4, pp. 502–513*).—The author concludes that "farm youth in many communities are in that interesting transitional stage between a rigidly controlled rural social order and a freedom-giving emancipated urban social order, struggling to make the step from an intimate locality group in which group purposes dominate individual action to a nonlocal, impersonal secondary group in which individualization has become highly developed. And they are moving more rapidly toward the goals of an urbanized social order than the parent generation in most areas, often bringing the parent generation along although not without great effort, but in far too many cases leaving the older generation behind after a period of struggle and conflict during which the new freedom has been gained. This seems to be the essence of the youth problem in the farm community of today."

## AGRICULTURAL AND HOME ECONOMICS EDUCATION

**Agricultural education: Organization and administration** (*U. S. Dept. Int., Off. Ed., Vocat. Div. Bul. 13 (1939), pp. VI+50*).—This revision (E. S. R., 63, p. 787) gives information on the organization and administration of vocational education in agriculture under the Smith-Hughes and George-Deen Acts. The parts deal with the general provisions of the acts, developing a program within a State, and development of comprehensive local programs.

**[Abstracts of papers on agricultural and home economics education]** (*Assoc. South. Agr. Workers Proc., 41 (1940), pp. 54–58, 64, 101–104, 138, 139, 178–181, 212, 213*).—Included are abstracts of papers presented at the forty-first annual convention of the Association of Southern Agricultural Workers at Birmingham, Ala., February 7–9, 1940, on teaching and 4–H club and other extension work in farm structures, electrification, cotton ginning, animal production, diseases of crops, etc.

**Studies in home economics education, 1918–1940, reported in published form** (*Fed. Security Agency, U. S. Off. Ed., Vocat. Div. Misc. 2381 (1940), pp. III+20*).—The publications are grouped by sources—colleges and universities, State and city departments of education, periodicals, U. S. Office of Education, and miscellaneous, with an index by subjects.

**For better rural living: A report of cooperative extension work in agriculture and home economics in 1938** (*U. S. Dept. Agr., Ext. Serv., 1940, pp. III+45*).—Various activities and results are described and tabulated, including the Federal and State funds available and the purposes for which used.

**Statistical techniques adapted to home economics problems, C. M. Brown and H. M. Hatcher** (*Minneapolis, Minn.: Burgess Pub. Co., [1939], pp. [1]+VI+104, figs. 32*).—This handbook discusses the value of statistical knowledge to home economics teachers, simple statistical technics adapted to problems encountered in home economics, interpretation of data, and preparation of a technical report.

**The Pacific Northwest: A selected bibliography, 1930–1939,** J. B. Appleton (*Portland, Oreg.: Northwest Region. Council, 1939, pp. [6]+XX+5–456*).—This selected bibliography of 4,635 references deals with the physical and human resources of the Pacific Northwest. Part 1, completed research—published and unpublished, deals with topics on natural resources under the following headings with critiques: (1) General concepts of the Northwest (critique by R. F. Bessey), (2) agriculture (critique by H. E. Selby), (3) forest resources and utilization (critique by S. A. Wilson), (4) mineral resources (critique by E. T. Hodge), (5) water resources (critique by S. B. Morris), (6) power resources (critique by I. Bloch), (7) fisheries (critique by J. A. Craig), (8) human resources and problems (critique by J. F. Steiner), (9) commerce and industry (critique by J. C. Rettie), (10) Government (critique by R. Barthell), (11) education (critique by W. L. Uhl), (12) planning (critique by P. Hetherton), (13) maps and diagrams (critique by O. W. Freeman), and (14) bibliographies.

Part 2, research in progress, gives information as to probable date of completion, address of researcher, scope and purpose of project, and type of reader for whom the manuscript is being prepared. Part 3 lists contemplated projects.

## FOODS—HUMAN NUTRITION

**[Foods and nutrition studies by the Florida Station]** (*Florida Sta. Rpt. 1939, pp. 85, 86, 100, 101*).—In this annual report summaries, representing for the most part an extension of earlier work (E. S. R., 81, p. 300), are given by R. B. French on the vitamin C content of Florida fruits and vegetables (p. 85); by H. W. Winsor on the mineral content of vegetable crops with special reference to iron (pp. 85, 86); by O. D. Abbott, M. R. Overstreet, and C. F. Ahmann on the extent of nutritional diseases, particularly anemia, among children (E. S. R., 83, p. 274), young girls, women, and college students, and the mineral composition of water, vegetables, and soil from homes of selected children in this study (pp. 100, 101); and by Abbott on the chemical composition and nutritive value of several Florida honeys, and the standardization of home-canned tomatoes and tomato juice (p. 101).

**Proximate composition of American food materials,** C. Chatfield and G. Adams (*U. S. Dept. Agr. Cir. 549 (1940), pp. 91*).—This compilation, superseding the tables of Atwater and Bryant (E. S. R., 11, p. 379), gives new average values for over 1,100 plant and animal foods on American markets. The values, offering a working basis for diet calculations, are reported in terms of percentage of refuse, water, protein, fat, ash, total carbohydrates, and fiber; sugars, starch, and acid are reported for some foods. Fuel value is given in terms of calories per 100 gm. and per pound. The constituents are reported on the edible portion and the as-purchased bases. The table on composition is prefaced by brief statements on sources and derivation of the data and the meaning of the terms, and by notes on certain classes of foods, and on the use of the data. For the benefit of persons preparing diabetic diets, a classification of fruits and vegetables according to their carbohydrate content is included.

**The proximate constituents and the composition of the ash of the principal African cereals (Triticum durum, Zea mays, Hordeum distichon, Sorghum aethiopicum, Eragrostis abyssinica, Pennisetum typhoideum, and Eleusine coracana)** [trans. title], G. Fabriani (*Quad. Nutr., 6 (1939), No. 1, pp. 72–81*).—Moisture, nitrogen, protein (N×6.25), total and reducing sugars (as glucose), sucrose, starch, pentosans, crude fiber, fat, and ash are reported for these cereals, together with data on K, Na, Ca, Mg, Fe, S, P, and Cl reported as percentage of the air-dry cereals and as percentage of the ash, the milligram equivalents of these elements, and the calculated acid or base values. Informa-

tion is given for each cereal on the weight per 1,000 kernels and on the weight per hectoliter. The analyses were carried out by the methods adopted by the commission for the study of nutrition problems of the [Italian] National Research Council.

**Proximate and mineral constituents of some seeds of African legumes** [trans. title], G. Fabriani (*Quad. Nutr., 6 (1939), No. 2, pp. 219–226*).—*Canavalia ensiformis, Lens abyssinica* (whole and also decorticated seeds in each case), *Cicer amaricum* (two varieties), *Phaseolus mungo, Cordeauxia edulis* (decorticated seeds), and *Linum minus* were the legumes studied. Proximate constituents, including total and reducing sugars and sucrose, starch, pentosans, and crude fiber, and the minerals K, Na, Ca, Mg, Fe, S, P, and Cl were determined, and the base or acid values calculated from the mineral equivalents.

**The chemical composition of the banana of the variety "Giuba" cultivated in Italian Somaliland** [trans. title], G. Fabriani (*Quad. Nutr., 6 (1939), No. 2, pp. 199–208*).—This variety, Giuba, belonging to the species *Musa nana* is noted as being cultivated commercially. The percentage of edible portion and the proximate constituents, including total and reducing sugars, sucrose, and starch, are reported for the fruit at four stages of maturity, and the values for the mature fruit are compared with analyses quoted from various sources (cited). Data on Na, K, Ca, Mg, Fe, S, P, and Cl, expressed as percentages of the fresh edible portion, are reported for this variety and similar data are quoted for other varieties. Milligram equivalents and calculated base values are given for the green and ripe fruits.

**The chemical composition of products derived from the banana of the variety "Giuba"** [trans. title], G. Fabriani (*Quad. Nutr., 6 (1939), No. 2, pp. 209–218*).—The data on proximate and mineral constituents and the calculated base value of the banana flour at its normal moisture content (12.5 percent) are reported and compared with cited figures for similar products. Moisture, determined at 45°–50° C. in vacuum, and proximate constituents reported on this moisture basis are also given for banana flours from unripe, partially ripe, semiripe, and fully ripe fruits of this variety. Original and quoted data are also given for the proximate constituents of the fig banana and for so-called marmalades and gelatin prepared from it, and on both proximate and mineral constituents of its skin.

**Analysis of Ceylon foodstuffs.—VIII. Further analyses of local food stuffs with particular reference to their mineral composition**, A. W. R. Joachim, S. Kandiah, and D. G. Pandittesekere (*Trop. Agr.* [*Ceylon*], *93 (1939), No. 6, pp. 336–342*).—Continuing studies noted earlier (E. S. R., 80, p. 130), analyses are presented for the edible portion of additional Ceylonese-grown foods designated by botanical, English, and native names. The methods of analysis were the same as in the earlier studies except that a Lovibond tintometer was used for making color comparisons in the iron determinations. Data are reported on the proximate constituents of a number of grains, seeds, roots and tubers, and coconut water, calcium, phosphorus, and iron also being reported for these same foods. A number of leafy vegetables and fruit forms were studied with particular reference to their mineral (Ca, P, and Fe) composition and the variation of the latter with place of origin of the foodstuff. Results are tabulated.

**The food of the present-day Navajo Indians of New Mexico and Arizona**, T. M. Carpenter and M. Steggerda (*Jour. Nutr., 18 (1939), No. 3, pp. 297–305*).—Data on moisture, fat, total nitrogen, and calories per gram (as determined by oxycalorimeter) are reported on the air-dry basis for 66 typical Navajo foods designated by the common English names. These include dry and roasted corn

and corn flour; breads, dumplings, and mush; a few vegetables; fruits, nuts, and berries; seeds of grasses and weeds; meats; juniper ashes; and clay. The weight lost in drying to the air-dry condition is also reported to permit calculations to the fresh basis. The diet of the Navajo Indian was found to consist chiefly of mutton (goat or sheep), practically all parts of the animal being eaten. A study of the character and amount of food eaten by 5 Navajo families indicated that the average family (6 or 7 persons) eats one goat each week and in addition about 10 kg. of flour, 2.5 kg. of white sugar, 1 kg. of coffee, and such vegetables as may be available.

**The canned food reference manual** (*New York: Amer. Can Co., [1939], pp. 242, figs. [50]*).—This manual conveniently brings together technical information issued by the American Can Co. since 1935 in various professional journals, summarized under the following headings: Canning technology, canned foods in human nutrition, public health aspects of canned foods, the past 20 yr. of canning research, useful facts about commercially canned foods, and the Federal Food, Drug, and Cosmetic Act. The appendix presents many useful data and tabulations, including a list of commercially canned foods; information on case capacities for common can sizes; canned food production figures; compilations of proximate analyses, of vitamins, and of pH values of canned foods; and pertinent data on other common foods, together with other dietary information, all adapted from quoted sources. Literature citations are given throughout.

**Keeping foodstuffs fresh with special regard to the use of cold** (*18. Internatl. Cong. Agr., Dresden, 1939, Sect. 7, Main Rpts., pp. 15–28, figs. 4; Rap. Spéc., pp. 25–69, fig. 1*).—Under this topic the main report of a general nature was presented by O. Notevarp (Norway). Special reports were presented by R. Heiss (Germany), A. v. Osztrovszky (Hungary), C. A. Giambelli (Italy), D. Delić (Yugoslavia), H. W. Weedon (Norway), J. L. van Uffelen (Netherlands), D. St. Emilian (Rumania), G. Radulesco-Calafat (Rumania), and J. B. Verlot (France).

**Freezing and storage of foods in freezing cabinets and locker plants,** D. K. Tressler and C. W. DuBois (*New York State Sta. Bul. 690 (1940), pp. 60, figs. 20*).—The authors have brought together in this bulletin useful information from various sources on the construction and management of frozen food locker plants and farm freezing storage cabinets; freezing and storage temperatures; packages and wrapping materials; the preparation and freezing of meat, poultry, fish, shellfish, and game, fruits, and vegetables; and the preparation of frozen foods for the table. Information, based on studies carried out through the cooperation of the pomology and vegetable crops divisions of the station and Frosted Foods investigators, is tabulated on the varieties of New York State fruits and vegetables which give satisfactory frozen products. Other tabular material includes steps in the preparation of fruits and vegetables for freezing and cooking times for fresh and frozen vegetables.

**The effect of cooking and canning on the mineral constituents of certain vegetables,** G. Horner (*Jour. Soc. Chem. Indus., Trans., 58 (1939), No. 3, pp. 86–90*).—Vegetables of known variety and origin prepared for cooking or canning were analyzed in the raw state, as cooked vegetables (500 gm. of vegetable in 1,500 cc. of water or dilute brine), and as canned products; the weights of vegetable per A2 can, the nature of the brine, and the blanching procedure are noted. Cooking and canning were carried out in water of medium hardness. The drained solids and liquor were analyzed separately and the data so reported in the case of the cooked and canned vegetables, the weight of drained solids and the weight and specific gravity of the liquor being determined in each case. These latter data, though not reported, were used in calculating losses and in

calculating the weights of the blanched, cooked, and canned vegetables (drained solids) to a basis corresponding to 100 gm. of the raw vegetable. Ca, Mg, K, and P were the elements determined, and fresh and dried peas, stringless beans, dried beans, carrots, potatoes, and spinach were the vegetables analyzed. Mineral losses from the vegetables as incurred in the blanching, cooking, and canning processes are calculated and discussed.

The results indicate that vegetables cooked or canned in water of appreciable hardness gained Ca but lost other inorganic constituents in the process. Salt in the canned material had no appreciable effect on the distribution of the minerals between solid and liquid portions except in the case of Ca, and therefore is not of value in diminishing losses. Considerable loss, particularly of K, occurred in the blanching process.

**Comparative data obtained on some 1938 hard red spring wheat varieties by the use of four baking formulas,** R. H. Harris. (N. Dak. Expt. Sta.). (*Cereal Chem., 16 (1939), No. 4, pp. 533–540*).—Twenty-six samples of hard red spring wheats, differing in generic origin and analyzed for grade, test weight, and crude protein content, were milled into straight flours in an Allis-Chalmers experimental mill, and the resultant flours were analyzed for crude protein and ash and baked by four procedures. The wheat protein ranged from 13.3 to 17.0 percent and the flour protein from 12.5 to 16.2 percent. The ash in the flours was quite variable.

The baking procedures included the standard basic method with 5 percent sucrose; a milk-shortening formula, including 4 percent dry skim milk and 3 percent shortening; a milk-shortening-bromate formula, which included the milk-shortening formula plus 0.001 percent $KBrO_3$; and the malt-phosphate-bromate formula. The three latter formulas were all superimposed upon the standard basic. Statistical analysis of the findings indicated a significant difference in mean loaf volume, these mean volumes increasing in the order noted for the methods. The mean texture scores also differed significantly between methods, whereas crumb color did not. If a random selection of methods were assumed, differences between varieties were significant in respect to loaf volume, color, and texture scores, indicating variability in baking strength among hard red spring wheat varieties. Correlation coefficients for flour protein and loaf volume for the four baking methods were significant except for the milk-shortening-bromate method.

**Sweet potato starch in the bakery,** D. Scrivanich (*Bakers Tech. Digest, 14 (1939), No. 4, pp. 63–65, 67, figs. 7*).—To determine the effect of sweetpotato starch on bread, baking tests were carried out in which 0, 1, 2, or 4 percent (based on flour) of the starch was used in a standard formula prepared as a straight dough. Data on loaf weight when fresh and when 3 days old, on relative loaf volume, and on compressibility after 3 days showed that the loaf containing 1 percent of sweetpotato starch based on flour, although lighter in weight than the others, had the greater volume and the greater compressibility after 3 days. Grain, texture, color of crumb, and appearance of crust were also superior in this loaf. Subsequent tests on a large scale and under practical bake shop conditions confirmed the initial experimental results.

The effect of sweetpotato starch when added to a cake batter was also determined. The starch was added at levels of 0, 0.36, 0.73, 1.47, 1.83, 2.20, and 3.65 percent of the weight of the flour in the formula given. The cake containing 1.83 percent of the starch based on flour showed the least loss of moisture in 4 days, retaining at the same time the greatest compressibility of all test cakes. Moisture loss was retarded, however, when as little as 0.36 percent of the sweetpotato starch was used, although at least 1 percent of the starch was

necessary to appreciably affect the compressibility after 4 days. Crust, texture, taste, and flavor received the best scores in cakes containing 1–1.5 percent of sweetpotato starch. With the formula used, additions in excess of 2 percent had an adverse effect on the final product. Exploratory tests indicated further that this starch gave satisfactory results when used in pie fillings.

**Losses on boiling milk**, M. ANDROSS (*Jour. Soc. Chem. Indus., Trans., 58 (1939), No. 7, pp. 252–254*).—Data are reported on volume and weight losses incurred in boiling milk for different periods; on the wet and dry weights of skin and residue; and on the solids, ash, calcium, phosphorus, protein, albumin, and fat in the skin and residue and in the raw and boiled milk. Lactose was also determined in certain samples of milk before and after boiling. In all cases a pint of the milk in an aluminum pan was brought to a boil in 10 min.

Losses, as calculated from the data on the raw and boiled milks, amounted to 13.29 percent, 5.75, 13.73, 5.4, 13.58, 74.83, 23.50, 1.91, and 15.7 percent for total solids, ash, calcium, phosphorus, protein, albumin, fat, carbohydrate, and calories, respectively. Somewhat different values (chiefly lower) were obtained when the calculations were based on analyses of the skin and residue as compared with the raw milk. It is not considered an overstatement, however, to say that 10 percent of the nourishment of milk is lost on boiling. Except in the case of albumin, the change in composition is completely masked by the volume lost on boiling the milk. As far as the distribution of the losses is concerned, the data indicated that the fat was mainly in the skin, while protein and calcium occurred to a greater extent in the residue.

**The nutritive value of foodstuffs** [trans. title], H. G. KOEFOED, S. POSTMUS, and A. G. VAN VEEN (*Landbouw [Buitenzorg], 15 (1939), No. 4, pp. 193–226, pl. 1; Eng. abs., pp. 221, 222*).—Standard food tables for calculating diets are presented to cover the commonly used foods of the Dutch East Indies. Rounded values are given for the percentages of protein, fat, and carbohydrate, for calories per gram, and for vitamins A and $B_1$ expressed as International Units per gram. Fruits, vegetables, and animal products are included, the values for the latter being very general to cover such broad classes as fresh meat, dried meat, fresh fish, salted fish, etc. Food values and dietary calculations are discussed.

**The influence on agricultural production of actual or recommended changes in diet** (*18. Internatl. Cong. Agr., Dresden, 1939, Sect. 1, Main Rpts., pp. 29–35; Rap. Spéc., pp. 69–92*).—Under this topic the main report of a general nature was presented by W. Staniewicz (Poland). Special reports were presented by E. J. Kinnunen (Finland), R. Dumont (France), L. Randoin (France), and C. Jornescu (Rumania).

**Meat and meat products as sources of essential dietary factors**, C. A. ELVEHJEM. (Univ. Wis.). (*Amer. Soc. Anim. Prod. Proc., 31 (1938), pp. 343–350*).—An address.

**Milk is effective in a reducing diet**, J. H. FRANDSEN. (Mass. State Col.). (*Milk Plant Mo., 28 (1939), No. 7, pp. 27–29*).—Suggestions on use of milk in reducing diets have been brought together from various sources.

**The effect of different percentages of protein in the diet of six generations of rats**, J. R. SLONAKER (*Stanford Univ. Pubs., Univ. Ser., Biol. Sci., 6 (1939), No. 4, pp. 67*).—It was hoped to determine what percentage of protein in an otherwise well-balanced diet was best suited to produce the greatest efficiency of the various physiological functions of the rat and by so doing to establish certain principles that might possibly be used in experiments with other animals, including man. The five experimental diets used furnished, respectively, 10.3, 14.2, 18.2, 22.2, and 26.3 percent of protein of mixed origin; 43, 62, 73, 81,

and 85.5 percent of the total protein in these several cases, respectively, was of animal origin.

The results of the extended study are tabulated and discussed in detail under the following headings: Energy consumption and utilization; spontaneous activity; growth and development, including eruption of incisors, opening of eyes, opening of vagina, mated pairs, offspring, and stature; sterility; reproduction, including reproductive span and effect of lactation on mothers; offspring, including sex ratio and mortality of offspring; autopsies with special reference to kidneys; life span and weight at death; and cause of death. A general summary is given of the findings, which are considered to warrant the conclusion that the 14.2 percent protein diet, supplemented by a higher percentage of protein for rearing the young, was more efficacious than any of the others with respect to the physiological functions of the rat. However, since the diets used varied by 4-percent intervals, it is considered that possibly a slightly richer protein diet would have been better.

**The metabolic behaviour of phosphorus.—[I], Balance sheets of phosphorus in full-grown rats fed with tri-stearine and ammonium phosphate; II, Balance sheets of phosphorus in full-grown rats fed with tristearine and sodium phosphate,** A. Westerlund (*Lantbr. Högsk. Ann. [Uppsala], 7 (1939), pp. 131–154, figs. 4, Swed. abs., pp. 152, 153; pp. 229–245, figs. 5, Swed. abs., pp. 244, 245*).—In the first study seven adult male albino rats were given a diet very low in calcium, phosphorus, and fat-soluble vitamins and containing about 9.5 percent of tristearin (to render calcium insoluble in the intestinal tract) to which different quantities of $(NH_4)_2HPO_4$ had been added. This diet was fed during a 10-day period. Intake of calcium and phosphorus, as well as excretion of these elements in the feces and urine, were measured for the last 5 days.

There was wide variation between the animals with regard to the urinary and the fecal elimination of phosphorus, but the variation was less pronounced in the case of the calcium. No reason for the variation in the fecal output of calcium was evident, and, in particular, varying consumption of phosphorus was not considered responsible. Variation in the intake of phosphorus, and this alone, was responsible for the wide variation in urinary phosphorus. The amounts of phosphorus consumed were excreted practically quantitatively by the kidneys. In spite of this the content of calcium in the different samples of urine was rather uniform and not related to their varying content of phosphorus. The excretion of urinary calcium accounted for about 2.5 percent only of the total excretion of this element.

In the second study $Na_2HPO_4.2H_2O$ replaced the $(NH_4)_2HPO_4$. The results obtained were essentially the same as in the first experiments except that urinary elimination of phosphorus was found to be controlled not only by consumption of phosphorus but apparently also by the varying consumption of sodium.

**The total and available iron in vegetable foods,** E. F. Yang and M. Y. Dju (*Chin. Jour. Physiol., 14 (1939), No. 4, pp. 479–487*).—Total and available iron, determined by methods outlined and using αα-dipyridyl, and glucose as a reducing agent, are reported for 10 cereals and cereal products, 16 legumes and legume products, and 31 vegetables, including cucurbits, roots, leaves, and others. Moisture is also reported, together with values for ionizable iron calculated as percentage of total iron, the latter values being compared with available data cited from other sources. "Matured cereal grains contain 45–70 percent of iron in ionizable form, matured legumes about 85 percent, while fresh and sprouted beans and fresh corn contain much less ionizable iron. Green vegetables show great variation in the amount of available iron present. Alfalfa, water celery,

celery, lettuce, shephards-purse, spinach, calabash, and loofah are very good sources of available iron. Peiping cabbage, small cabbage, mustard leaves, turnip, and water bamboo are moderately good."

**Iron metabolism in infancy.—I, Factors influencing iron retention on ordinary diets; II, The retention and utilization of medicinal iron, H. W. JOSEPHS** (*Bul. Johns Hopkins Hosp., 65 (1939), No. 2, pp. 145–166, figs. 5; pp. 167–195, figs. 10*).—The work presented in these two papers represents a continuation of an earlier study on iron metabolism in infants (E. S. R., 73, p. 876).

The first paper is concerned with iron balance studies made to ascertain the factors influencing retention of iron on milk and cereal diets. Data with regard to age, hemoglobin (grams per 100 cc.), body weight, duration of metabolism period, and iron intake, retention, and excretion, all three expressed as milligrams per kilogram per day, are reported in detail, and with comments for each infant; the numerous cases are classified as under 3 mo. of age, between 3 and 6 mo., and over 6 mo. Iron intake was calculated from actual analyses of aliquots of the food consumed; retention was calculated as intake minus output, the latter, also a determined value, representing the total iron occurring in the stools. This iron output was considered to be made up of any food iron not absorbed and whatever iron might be excreted into the gut. Since there was evidence that on an average 60 percent of the iron taken in with the food was absorbed, excretion was expressed as (intake×0.6) minus retention.

Excretion tended to vary with age, being somewhat greater in the first 3 mo. of life but thereafter relatively constant. Infections and lack of vitamin D tended to diminish retentions, although the deviation from normal was never enough to contribute significantly to iron deficiency. In the case of infection, lower retention appeared to be caused by lower food intake due to loss of appetite. In anemia, on the other hand, retention of iron tended to be slightly above the average even though hemoglobin was falling. This is evidence against an iron deficiency in the ordinarily accepted sense, but suggests that the tissues may possess an "avidity" for the iron. One possibility is that the iron is thus held in the tissues in an unavailable form, but another possibility is that it is merely stored there to be utilized when the conditions are right.

The second paper reports on a series of 47 short iron metabolism studies conducted on infants, some normal, others suffering from nutritional anemia, and varying in age from 3 weeks to 27 mo. During these periods of 5 or 6 days, inorganic iron was given in varying but relatively small amounts.

Retention of iron was found to be enhanced when the intake was above a level of 2 mg. per kilogram of body weight per day. Below this level the body was usually in iron balance until the intake fell to about 0.1 mg. per kilogram, when the balance tended to become negative. Age had little influence on retention, but anemic infants retained iron better than nonanemic infants. Excretion of increased intakes did not take place until 24–36 hr. after the discontinuance of medication, this being merely the time required for passage through the intestinal tract. Reexcretion of the ingested iron at the low level studied was, therefore, at a minimum, and for all practical purposes retention was equal to absorption. Below the age of 6 mo. utilization of retained iron for hemoglobin formation depended on age or rate of growth; above this age it appeared to depend on retention. It is considered that this correlation would not apply if retention were great enough to more than satisfy the requirement for hemoglobin formation.

Administration of copper along with the medicinal iron caused an increase in the total utilization of iron but not in the rate of utilization; nor did the

copper influence the amount of iron retained. A period of high iron feeding did not result in an immediate increase in hemoglobin. Apparently, therefore, iron taken into the body was deposited in the tissues or "stored" for several days preceding utilization. Percentage of utilization charted against retention indicated that anemic infants utilized iron more efficiently at lower levels of retention. The utilization was about 100 percent with retentions of about 2 mg. or less per kilogram of body weight. The utilization of freshly retained iron appeared to end in about 2-3 weeks, even though all of the iron had not been used up and even though a new period of iron medication could elicit a further hemoglobin increase. It is considered possible, therefore, that the iron might have been changed to a less available form, or more likely that the "stimulation" produced by medicinal iron may have lasted only through this period. The period of rising hemoglobin coincided roughly with that of reticulocyte increase. It was concluded that the medicinal iron had an important "regulatory" function in addition to that of supplying a building stone for hemoglobin.

**The retention and excretion of selenium after the administration of sodium selenite to white rats,** R. A. GORTNER, JR., and H. B. LEWIS (*Jour. Pharmacol. and Expt. Ther., 67 (1939), No. 3, pp. 358-364*).—Young white rats, over periods ranging from 28 to 143 days, were fed basal diets containing sodium selenite at levels of 25, 35, and 50 p. p. m. The diets were deficient in the sulfur-containing amino acids, but were fortified with cystine or methionine in amounts adequate to promote good growth. The selenium content of the combined liver, kidneys, and spleen of the individual rats ranged from 0.03 to 0.17 mg. or from 0.4 to 2.8 percent of the selenium ingested. No correlation between the selenium concentration of the diet and that of the organs could be demonstrated, and apparently the ingested selenium was rapidly eliminated. From 20 to 50 percent of the amount ingested was excreted in the feces, but here again there was no correlation with the selenium concentration in the diet. It is believed that the greater part of the fecal selenium originates from the dietary selenium escaping absorption.

**Distribution of fluorosis in India and in England,** D. C. WILSON (*Nature [London], 144 (1939), No. 3638, p. 155, fig. 1*).—A brief note is made of the recognition of endemic fluorosis in men and animals in the Madras Presidency, the Hyderabad, and the Punjab. Analyses indicated the presence of fluorine in the well waters. In the Punjab the afflicted areas lay over a buried ridge of larvas associated with granites and rhyolites. Dental fluorosis was also observed in a number of areas in England; in some of these, analyses of the water had been made and fluorine was found present. In one region, the Marston Valley, the "knotts" clay was found to contain more than 450 p. p. m. of fluorine.

**The basal metabolic rate of normal individuals in New Orleans,** A. G. EATON. (La. State Univ.). (*Jour. Lab. and Clin. Med., 24 (1939), No. 12, pp. 1255-1263*).—Basal metabolic rates of middle-class white persons long resident in New Orleans were determined on 98 women and 62 men, all of whom were in good health and none of whom exhibited endocrine disturbances. The values, representing first determinations for the most part and expressed as Calories per square meter per hour, are tabulated, together with deviations (calculated as percentage variations) from Aub and DuBois, Harris and Benedict, Dreyer, and Mayo Foundation standards. The deviations indicate that all four standards are too high for the New Orleans subjects. The data show, however, that the metabolic rates of subjects living in this area can be satisfactorily expressed by applying a correction factor of −10 percent to all values of the Aub and DuBois standards or of −11 percent for men and −7 percent for

women to the Mayo Foundation standards. These corrections are shown to be valid statistically.

**The vitamine-content of the most important foodstuffs in the different seasons** (*18. Internatl. Cong. Agr., Dresden, 1939, Sect. 9, Main Rpts., pp. 23–30, figs. 3; Rap. Spéc., pp. 37–46*).—Under this topic the main report of a general nature was presented by M. van Eekelen (Netherlands). Special reports were presented by A. Scheunert (Germany), O. Turpeinen (Finland), and S. Baglioni (Italy).

**Vitamins and related substances in yeast,** M. A. Joslyn. (Univ. Calif.). (*Brewers Digest, 14 (1939), No. 12, pp. 26, 27*).—This is a brief survey leading to the conclusion that "different yeasts exhibit decidedly different capacities for the elaboration of vitamins, and these capacities may be attained or repressed by manipulation of cultural conditions."

**Mineral constituents and vitamins of wheat** [trans. title], G. Quagliariello (*Quad. Nutr., 6 (1939), No. 3, pp. 276–289*).—A review with 56 references. Data on mineral constituents are quoted from a number of sources.

**The content of vitamin A-active compounds in Danish foodstuffs.—III, The content of carotenoids, chiefly β-carotene, in some raw and cooked vegetables** [trans. title], H. Willstaedt and H. B. Jensen (*Ztschr. Vitaminforsch., 9 (1939), No. 1–2, pp. 8–13, fig. 1; Fr., Eng., abs., p. 13*).—Calibration curves are presented for β-carotene determined colorimetrically by means of the step photometer and with the use of several different filters. Determination of carotene in vegetables by this method is considered to give more accurate values than determination of total carotenoids, the values for the latter being too high. Total carotenoids and in most cases also β-carotene were determined in various samples of raw, cooked, and canned carrots, in raw and cooked cabbage and brussels sprouts, and in raw turnips, kohlrabi, and sugar beets. In brussels sprouts separate analyses of the outer green leaves for total carotenoids showed very high values (191.9γ per gram of fresh substance) as compared with samples analyzed after trimming (3.3γ per gram). The cooking procedures used were found to cause no appreciable decrease in the content of carotenoids.

**The content of vitamins A and $B_1$ in walnuts, hazelnuts, almonds, and peanuts** [trans. title], L. De Caro and J. Franceschini (*Quad. Nutr., 6 (1939), No. 1, pp. 82–86, figs. 4*).—Fresh and dry walnuts (*Juglans regia*), peanuts (*Arachis hypogaea*), hazelnuts (*Corylus rostrata*), and almonds (*Amygdalus communis*), assayed by a rat growth method, are reported to contain 1.2, 1.3, 3.6, 4.4, and 5.8 International Units of vitamin A per gram, respectively. In the vitamin $B_1$ assays the daily quantity of the nut required to permit a 60-day survival of vitamin $B_1$-deficient rats was determined, the $B_1$ content per gram of nut being calculated from these results as 1.4, 1.4, 0.6, and 1.0 I. U. for walnuts, hazelnuts, almonds, and peanuts, respectively.

**The minimum vitamin-A requirements of normal adults.—II, The utilization of carotene as affected by certain dietary factors and variations in light exposure,** L. E. Booher and E. C. Callison. (U. S. D. A.). (*Jour. Nutr., 18 (1939), No. 5, pp. 459–471, fig. 1*).—In continuation of the series noted previously (E. S. R., 83, p. 278), comparative minimum vitamin A requirements were determined for one adult subject for carotene in cottonseed oil and in cooked peas, one for carotene in cottonseed oil, cooked peas, and cooked spinach, and one for carotene in cottonseed oil and cooked spinach. In another subject the requirement was determined for carotene in cooked spinach alone. For further comparison, earlier values showing the relationship of vitamin A in cod-liver oil and carotene in cottonseed oil are included in the tabulated data.

The earlier figures showed a ratio of carotene requirement to vitamin A requirement ranging from 1.61 to 1.84. The two values obtained in the present study for the ratio of pure carotene to carotene in cooked green peas were 1.62 and 1.68 and for pure carotene to carotene in cooked spinach of 1.24 and 1.22. In terms of the minimum daily quantities of vitamin A required for normal dark adaptation, 47 and 57 units per kilogram of body weight, respectively, were required for the two subjects receiving practically all of their vitamin A from the carotene in cooked green peas; and 77, 87, and 101 units per kilogram of body weight for three subjects on cooked spinach.

Studies of the possible effect of other factors in modifying the requirement or utilization of carotene in vegetables, with one or two subjects for each test, are also reported, with the conclusion that a daily intake of thiamin in excess of 400–600 International Units, or of riboflavin in excess of about 1,800–2,400 μg., or of dietary fat in an ordinary mixed diet in excess of 30–35 percent of the total calorie intake did not improve the utilization of carotene by adults or decrease their minimum physiological requirement for vitamin A. A marked increase or decrease in the exposure of the eyes to ordinary light sources was not accompanied in the single subject tested by altered requirements for vitamin A.

Data are included on the average composition of the experimental diets, dark adaptation values for one subject, and the influence of the factors studied in terms of average light thresholds after 6 and 30 min. of dark adaptation.

**Vitamin A in the blood of normal adults.—The effect of a depletion diet on blood values and biophotometer readings,** G. Steininger, L. J. Roberts, and S. Brenner *(Jour. Amer. Med. Assoc., 113 (1939), No. 27, pp. 2381–2387, figs. 3)*.—Chemical determinations of the carotene content of the blood by the method of Clausen and McCoord (E. S. R., 76, p. 585) and the vitamin A content by a modification of the Carr-Price antimony trichloride method, and biophotometer dark adaptation tests are reported for four women subjects during a 4-mo. period of vitamin A depletion and subsequent treatment with small doses of vitamin A. Similar determinations were made on a control subject and single blood determinations on 34 adults on uncontrolled diets, with half receiving a vitamin A supplement. Biophotometer readings were made on 31 of this group. In the first group the levels of vitamin A in the fasting blood at the beginning of the study ranged from 7.1 to 22.1 blue units and the carotene from 60 to 85 μg. per 100 cc. of serum, the levels being related to the dietary history. Continuance of the depletion diet caused a marked fall in vitamin A and carotene levels, with a tendency for the values of all of the subjects to approach that of the subject with the lowest original value. At the end of the depletion period small supplements of vitamin A in the form of U. S. P. standard cod-liver oil caused the vitamin A in the blood to rise rapidly but had no effect on the carotene content. The vitamin A levels reached and the length of time the higher levels were maintained depended upon the size of the supplement given. No correlation was evident between the amount of vitamin A in the blood and the biophotometer readings.

**The photocolorimetric determination of vitamin A and carotene in human plasma,** M. S. Kimble. (Univ. Wis.). *(Jour. Lab. and Clin. Med., 24 (1939), No. 10, pp. 1055–1065, figs. 2)*.—The method described in detail as to reagents, procedure, calculations, and corrections is essentially the Carr-Price method adapted for use with the Evelyn photoelectric macrocolorimeter with filters 440 and 620. Plasma (3.5–5.0 cc.) from oxalated blood is extracted with alcohol and petroleum ether, the pigments being retained in the alcohol layer, with the carotene and vitamin A going quantitatively into the petroleum ether layer. At this stage the yellow color of the carotene in the solution is deter-

mined in the colorimeter, using the 440 filter (blue). The reading obtained is used later to apply a correction, since the blue color of the Carr-Price reaction is due to vitamin A and carotene. The petroleum ether is removed from the colorimeter tube by aeration, and the residue taken up in chloroform. An $SbCl_3$ blank and the tube containing the extract are placed in reading position in the colorimeter with filter 620 (red), the $SbCl_3$ is added all at once to the unknown, and the reading of the galvanometer is recorded at the moment of momentary stability (which coincides with the height of the color formation). The rapidity of fading occurring after this rather than the point of color maximum is altered by impurities of the reagents; repurification and anaerobic handling of the latter were, therefore, not necessary with the use of the macroinstrument. The method gave consistent and reproducible results, the significant part of the experimental error being in the original extraction rather than in the subsequent steps of the determination.

"Results for plasma carotene and vitamin A are given for 30 men and 34 women in good health. While the figures for carotene were slightly higher on the average in the female group, those for vitamin A were found distinctly higher for the males than for the females, with averages 2.18 and $1.56 \times 10^{-3}$ 'L value' units roughly equivalent to 127 and 91 International Units of vitamin A per 100 cc. of plasma, respectively. Coefficients of variability for the vitamin values in the two groups were 0.229 and 0.237. Vitamin A appears to be present in the plasma in a relatively stable form, and to vary little under constant physiologic conditions in individuals who are not taking oil concentrates."

**The pathogenic and diagnostic significance of the carotene and vitamin A picture in serum** [trans. title], W. THIELE and I. SCHEFF (*Klin. Wchnschr., 18 (1939), No. 36, pp. 1208–1211*).—Carotene and vitamin A were determined in the blood serum of patients suffering various pathological conditions. The photometric methods used are discussed briefly. Values for carotene in milligrams and vitamin A in International Units per 100 cc. of serum are reported, and the results are interpreted as permitting the following rather general conclusions:

A lower serum content of provitamin and vitamin A may be encountered as a transient condition in practically all diseased states. A higher vitamin A value is as good as never encountered in cases of malignancy. Simple enlargement of the thyroid gland (colloid goiter) does not in general lead to a decrease in serum vitamin A, although hyperthyroidism frequently leads to a lowering of the vitamin A level. The height of the carotene-vitamin A level in the serum in diabetes mellitus is probably not conditioned by diet alone but is often associated with lipemia.

**Experimental study of the influence of vitamin A on the thrombocytes and the bone marrow** [trans. title], J. ANAGNOSTU (*Klin. Wchnschr., 18 (1939), No. 38, pp. 1277–1279, figs. 3*).—Young rats were used as the experimental animals. Of the six rats selected from each litter, four were given a vitamin A-free diet and two were continued as normal controls. At the beginning of avitaminosis (about 25 days), a count and qualitative study were made of the thrombocytes in all of the animals. This was repeated from time to time and finally, as the rats were killed, at intervals from the thirty-fifth to the fifty-second day of the diet period. At this time observations were made as to macroscopic changes in the organs and histological changes in the marrow of the femur.

It is concluded from the findings that vitamin A influences thrombocyte formation, and that a deficiency of the vitamin causes a decrease of 31–69 percent in the count. This decrease as a rule is independent of A-avitaminosis due to infection. Vitamin A also acts on the bone marrow. Under conditions of

A-avitaminosis there is a decrease in the cells, as well as a characteristic decrease in the eosinophiles, a complete atrophy of the bone marrow occurring at the same time. Vitamin A also apparently acts on the megakaryocytes, since vitamin A deficiency causes a decrease in the number of these cells and interferes with their development to the mature stage.

**Instruments and technics for the clinical testing of light sense, I–III,** I. L. SLOAN (*Arch. Ophthalmol., 21 (1939), No. 6, pp. 913–934; 22 (1939), No. 2, pp. 228–232, figs. 2; pp. 233–251, figs. 20*).—This paper, which is of value to those undertaking dark adaptation studies to determine nutritional status with respect to vitamin A, is presented in three parts.

I. *Review of the recent literature.*—A critical review of the literature is presented, with numerous footnote references. In the evaluation of the instruments and methods reviewed, the following requirements of an ideal clinical instrument for testing light sense were considered: "(1) A preexposure field of constant brightness is desirable in order that the initial level of adaptation of the eye may be standardized. (2) Means should be provided for illuminating the test field with light of a known composition, variable in intensity by known amounts over a wide range. (3) Since retinal illumination increases with the area of the pupil, there should be some method of eliminating or correcting for this variable factor. (4) Means should be provided for the control of fixation, since the light sense varies in different regions of the retina. (5) In order to distinguish between pathologic and normal sensitivity to light, the range of variation in a sufficiently large group of nonpathologic eyes should be known."

In the opinion of the author a number of problems require further investigation before tests of light sense can be considered of much value in clinical ophthalmology. Among these are the standardization of variable factors such as the level of previous light adaptation, pupil size, region of the retina tested, and means of controlling fixation; suitable criteria for distinguishing between pathologic and normal sensitivity to light; and the range in variation in normal eyes and determinations of the borderline between normal and pathologic.

II. *Control of fixation in the dark-adapted eye.*—A comparison is reported of the adequacy of different methods of fixation control for use in tests of the dark-adapted eye. By the use of the location of the Mariotte blind spot as an indicator of the direction of fixation, it was demonstrated that foveal fixation is maintained in the dark-adapted eye with a luminous red-fixation target, and that this device can be used in testing the light sense of any region of the retina except the fovea itself. For this point a perifoveal fixation target composed of four spots of luminous paint, with a 6° angular distance between the upper and lower and the right and left spots, was devised and found to be fairly satisfactory.

III. *An apparatus for studying regional differences in light sense.*—An instrument devised to fulfill the five requirements enumerated in part 1, and also to provide means for testing the light minimum in any region of the retina, is described and illustrated by photographs and diagram, and the results obtained with its use in preliminary tests on one normal subject and five with various pathological conditions of the eye are presented. In these tests two of the specific requirements of the ideal instrument were ignored—standardization of pupil size and norms for distinguishing between pathologic and normal light thresholds.

It is concluded from these preliminary studies that different forms of ocular pathologic conditions may be associated with deficiencies in sensitivity to light which differ both qualitatively and quantitatively, but that further detailed studies are needed to determine the types of defect in light sense characteristic

of different forms of ocular pathologic conditions. "Previous studies have emphasized chiefly the rate of dark adaptation and have paid little attention to regional differences in sensitivity."

**The water-soluble B-vitamins, XIII, XIV**, M. M. EL-SADR, T. F. MACRAE, and C. E. WORK (*Biochem. Jour., 33 (1939), No. 4, pp. 601–610, 611, 612*).—This is a continuation of the series of papers, most of which have been noted previously.

XIII. *Alloxazine-adenine-dinucleotide, adenylic acid, nicotinamide, and pimelic acid in the nutrition of the rat.*—Experiments are reported in which the possibility was studied of replacing for the nutrition of the rat certain of the recognized members of the vitamin $B_2$ complex by other biologically important substances, including (1) alloxazine-adenine-dinucleotide as a substitute for riboflavin and possibly some other member of the complex, (2) a combination of yeast adenylic acid and nicotinamide as a substitute for yeast filtrate or yeast eluate factors or the additional unidentified factor in the vitamin $B_2$ complex, and (3) pimelic acid as a substitute for yeast filtrate factor.

Alloxazine-adenine-dinucleotide proved capable of replacing equimolecular amounts of riboflavin but no other member of the complex. The combination of adenylic acid and nicotinamide proved incapable of replacing either the yeast eluate factor or the yeast filtrate factor for growth and did not prevent the development of dermatitis in rats deprived of the eluate factor. Pimelic acid had no growth-promoting effect when substituted for the yeast filtrate factor.

XIV. *Note on the yeast eluate factor of the vitamin $B_2$ complex.*—By means of a comparison of a sample of the Lepkovsky crystalline factor I (E. S. R., 80, p. 239) with the authors' yeast eluate factor, it was definitely proved that the two are identical. When the Lepkovsky fractionation method for factor I was applied to concentrates of the eluate factor, a small amount of crystalline material was obtained which had the same melting point as factor I and also gave similar red coloration with $FeCl_3$ to that reported for vitamin $B_6$. In rat growth experiments crystalline factor I promoted growth of the same order as previously observed with the yeast eluate factor. In unpublished experiments by H. Chick, factor I also cured the florid type of rat dermatitis. "The identity of vitamin $B_6$, factor I, and yeast eluate factor is therefore established."

**The site of action of four water-soluble vitamins**, S. MAURER (*Jour. Amer. Dietet. Assoc., 15 (1939), No. 8, pp. 659–666*).—This brief review, presented as an address, is concerned with the action in the cells of vitamins C, $B_1$, and $B_2$ and nicotinic acid as part of the oxidation-reduction enzyme system.

**Some clinical neurologic aspects of vitamin B deficiencies**, C. D. ARING, J. P. EVANS, and T. D. SPIES (*Jour. Amer. Med. Assoc., 113 (1939), No. 24, pp. 2105–2110, figs. 4*).—The use of vitamin $B_1$ and nicotinic acid in the treatment of various neurological diseases is discussed, and practical dietary advice is given for decreasing vitamin $B_1$ deficiencies among the general population in government or other institutions where mass feeding is required and among persons with chronic debilitating diseases. Indications, with recommended dosage, are also given for supplementary treatment with pure vitamin $B_1$ and nicotinic acid orally and parenterally.

**The need for the addition of vitamin $B_1$ to staple American foods**, G. R. COWGILL (*Jour. Amer. Med. Assoc., 113 (1939), No. 24, pp. 2146–2151*).—This report, authorized for publication by the Council on Foods of the American Medical Association, brings together evidence from the examination of available food statistics and recently collected American dietaries and the observations of clinicians leading to the conclusion that American dietaries as a whole are unsatisfactory with respect to their content of vitamin $B_1$. Practical methods

of improving the situation are suggested, with particular emphasis on the addition of the vitamin in suitable quantities to wheat flour. "It is believed that prosecution of a program fostering addition of vitamin $B_1$ to staple American foods according to the principles discussed in the present report would be definitely in the interests of the public."

**The chemical determination of vitamin $B_1$ and cocarboxylase in organs** [trans. title], F. Widenbauer (*Klin. Wchnschr., 18 (1939), No. 52, pp. 1613, 1614*).—A thiochrome method somewhat similar to that of Westenbrink and and Goudsmit (E. S. R., 81, p. 454) is described. The present procedure eliminates the adsorption of the vitamin on fuller's earth and subsequent extraction with isobutanol, thereby eliminating any error from this step. Total vitamin $B_1$ may be determined directly on the extract of the tissue prepared by weak acid digestion followed by peptic digestion; with the omission of the isobutanol and of the ferricyanide reagent in this determination, it is claimed that the development of fluorescene by nonspecific substances from the animal tissue is lessened and that the test solution and the standard are more nearly comparable. Greater ease of determination is further attained in that the method permits of the reading of the intensity of fluorescence with the naked eye. Figures for total and free aneurin are reported for liver, kidney, brain, heart, and lung of normal guinea pigs and of normal rats and those in conditions of hypovitaminosis and avitaminosis.

**The glycogen content of the liver in vitamin $B_1$-deficient rats** [trans. title], V. S. Hermann (*Hoppe-Seyler's Ztschr. Physiol. Chem., 262 (1939), No. 3–5, pp. 95–102*).—Groups of rats on a vitamin $B_1$-free diet were sacrificed at weekly intervals from the second to the sixth week for determinations of the glycogen content of their livers. Average values for from 4 to 7 animals in each group were 3.59, 4.97, 3.01, 2.92, and 2.12 mg. percent. In two other series groups of 3 animals each on a vitamin $B_1$-free diet were given subcutaneous injections of vitamin $B_1$ in doses of 5γ for one group and 1 mg. for the other on the tenth, twentieth, and fortieth days of subsistence on the vitamin $B_1$-free diet. In the groups receiving 5γ the glycogen values were 4.00, 3.10, and 6.90 and in the groups receiving 1 mg., 5.04, 3.52, and 4.05 mg. percent respectively.

**Reduction of the d-amino-acid oxidase content of rat tissues in riboflavin deficiency**, A. E. Axelrod, H. A. Sober, and C. A. Elvehjem. (Univ. Wis.). (*Nature [London], 144 (1939), No. 3650, pp. 670, 671*).—Rats were depleted for 6 weeks on the riboflavin-deficient diet of Elvehjem, Koehn, and Oleson (E. S. R., 78, p. 285) and then fed for 2 weeks in groups of 5–7 each supplements of the W factor and riboflavin, alone and combined, after which they were sacrificed, and *d*-amino acid oxidase content was determined in suspensions of liver and kidney cortex. As controls other groups were fed the basal diet alone and a normal stock diet. The liver values increased in the order basal diet alone, with factor W, and with flavin, normal stock diet, basal diet+factor W+flavin ad libitum, and the same with food intake restricted to that of the animals on the basal diet alone. Values for kidney cortex increased in essentially the same order. "These results indicate the importance of riboflavin in the synthesis of the prosthetic group of *d*-amino acid oxidase, and that other members of the B complex may also be related to the formation of this enzyme."

**Flavin-adenine-dinucleotide in tissues of rats on diet deficient in flavin**, S. Ochoa and R. J. Rossiter (*Nature [London], 144 (1939), No. 3653, p. 787*).—Attention is called to the demonstration by Ochoa and Peters (E. S. R., 82, p. 278) of a decreased content of cocarboxylase in the tissues of pigeons fed

a vitamin $B_1$-deficient diet, and by Axelrod and Elvehjem (E. S. R., 81, p. 877) of a decrease in the cozymase content of tissues of dogs and pigs on a nicotinic acid-free diet. Evidence is now furnished of a similar diminution in the flavin-adenine-dinucleotide content of boiled extracts of tissues of rats fed a flavin-deficient diet. Differences were shown in all of the tissues tested (brain, heart, kidney, and liver), but were particularly marked in heart and liver tissues. The differences in the means of these tissues were clearly significant by the Fisher *t* test and are thought to "afford direct evidence of a further instance of a deficiency in the vitamin B complex affecting biological oxidation systems." A note added in proof calls attention to the similar findings of Axelrod, Sober, and Elvehjem noted above.

**Experimental contribution to the question of the relation between vitamin $B_2$ (lactoflavin) and the thyroid gland** [trans. title], H. WAHL (*Klin. Wchnschr., 18 (1939), No. 42, pp. 1363–1365, figs. 2*).—The effect of injected lactoflavin on basal metabolism, weight curves, and histological changes in the thyroid was studied in 47 guinea pigs, some of them having normal thyroid activity and others having hyperthyroidism induced experimentally by thyrotropic hormone. The results are interpreted to indicate that the increase in metabolic rate brought about by the injection of thyrotropic hormone was enhanced by the lactoflavin, which of itself exerted no apparent effect on the basal metabolism of normal animals. The course of the weight curves as affected by the hormone was not appreciably changed by the simultaneous administration of lactoflavin. The lactoflavin alone did not influence the histological picture of normal thyroids, nor did it appear to change the picture characteristically produced by the action of the thyrotropic hormone alone.

**Vitamin $B_6$ and skin lesions in rats,** P. GYÖRGY and R. E. ECKHARDT (*Nature [London], 144 (1939), No. 3646, p. 512*).—Three more or less distinct types of lesions observed in a group of over 100 rats on a vitamin $B^6$-free diet after cure of the specific dermatitis or acrodynia by natural or synthetic vitamin $B_6$ are described. These include, in addition to the type described in a previous note (E. S. R., 83, p. 568), a type characterized by matting of the hair over the abdomen, loss of hair around the chin, nose, and eyes, brown scales on the cheeks, abdomen, and forehead, emaciation, and inanition; and a type more rarely seen which corresponds to descriptions by the California (E. S. R., 76, p. 839) and Wisconsin (E. S. R., 81, p. 450) investigators of rats with watery eyes which stick together and sore mouth. It is pointed out that, in view of the fact that the part played by the vitamin $B_2$ complex in skin conditions has extended beyond vitamin $B^6$ the designation of this vitamin as adermin is misleading. "In accordance with the chemical nature of vitamin $B_6$, which is a pyridine derivative containing several oxy (methoxy) groups, the term pyridoxin appears to be appropriate."

**Nicotinic acid content of some foodstuffs** [trans. title], F. DEL REGNO (*Quad. Nutr., 6 (1939), No. 4, pp. 368–373*).—Nicotinic acid was determined in 43 samples of foods, including cereals and cereal products, legumes, fruits, vegetables, nuts, and milk. The determinations were made on water extracts and four values are reported in each case; these represent the results of determinations made by acid (0.1 N $H_2SO_4$) and by alkaline (0.1 N KOH) hydrolysis of the extract, combined with removal of the products of protein hydrolysis by precipitation with lead acetate or barium hydroxide. Recovery experiments indicated that acid hydrolysis combined with defecation with lead acetate gave the most satisfactory results, although all four procedures agreed fairly well. The nicotinic acid was determined finally by photocolorimetric procedure employing the reaction with cyanogen bromide and aniline.

**Nicotinic acid amide and cozymase in blood** [trans. title], H. V. EULER and F. SCHLENK (*Klin. Wchnschr., 18 (1939), No. 33, pp. 1109–1111*).—Cozymase in blood, determined by a fermentation procedure after preliminary inactivation of blood enzymes by heating, amounted to from 40γ to 80γ, 50γ, 60γ, 100γ, and 150γ per cubic centimeter in human, rat, rabbit, ox, and horse blood, respectively. Nearly all of it was in the corpuscles. Quantities of 200γ, 150γ, 160γ, and 220γ per gram of fresh tissue were found in rat muscle, heart, kidney, and liver, respectively, while 140γ and 150γ per gram were found in rabbit brain and nerve.

Nicotinic acid amide, determined by a colorimetric procedure with cyanogen bromide and aqueous aniline as reagents, was found in human blood and erythrocytes, and in ox, rabbit, and rat blood, for which values of 1.5γ per cubic centimeter, 3γ per gram, and 2γ, 3.3γ, and 3γ per cubic centimeter, respectively, are reported.

Intravenous injection of 40 mg. of nicotinic acid in one subject failed to increase the free nicotinic acid amide, which amounted to 1γ per cubic centimeter of blood before and after the injection, but did increase the cozymase content in 40 min. from 40γ to 50γ per cubic centimeter. This increase in cozymase corresponded to 1.8γ of nicotinic acid amide per cubic centimeter. Assuming a total blood volume of 4.5 l., the 40-mg. injection should have amounted to about 9γ of nicotinic acid per cubic centimeter Apparently, therefore, about four-fifths of the injected nicotinic acid amide disappeared from the blood stream in 40 min. A study of human urine indicated that nicotinic acid amide and the acid itself occured in about equal quantities, varying from 5 to 25 mg. per day. Following oral administration of 1 gm. of nicotinic acid, about 10 percent of it was excreted in the urine in 2 days, urinary values returning to normal after that time.

**The retention of nicotinic acid in the body fluids in pellagra and in health** [trans. title], W. W. KÜHNAU (*Klin. Wchnschr., 18 (1939), No. 41, pp. 1333, 1334, figs. 2*).—Nicotinic acid in human blood was found to vary from 250γ to 450γ percent in normal persons and from 75γ to 180γ percent in four pellagrins studied. In the normal individuals urinary elimination varied from 50γ to 300γ percent and in the four pellagrins from 64γ to 105γ percent. Tests on a normal individual in an optimal nutritional state and on a pellagrin, both receiving 0.1 gm. of nicotinic acid daily, showed that urinary elimination in the two subjects was very similar, amounting to from 2 to 4 percent of the daily intake. Upon remission of symptoms in the pellagrin there was still no change in the urinary elimination. Upon increase of dosage to 0.3 and 0.5 gm. daily in another patient no greater increase in urinary excretion was observed. Two pellagrins with decided neurological symptoms gave the unexpectedly high values of 100γ and 220γ percent, respectively, of nicotinic acid in the cerebral spinal fluid. The blood content amounted to 180γ and 140γ percent, respectively. Another pellagrin presented, however, the low blood value of 70γ percent.

**Avitaminosis occurring in diabetic patients under insulin therapy**, V. P. SYDENSTRICKER, L. E. GEESLIN, and J. W. WEAVER. (Univ. Ga.). (*Jour. Amer. Med. Assoc., 113 (1939), No. 24, pp. 2137, 2138*).—Three case reports are presented in substantiation of the hypothesis that the glossitis and stomatitis frequently occurring in diabetes with insulin treament is an avitaminosis caused by abnormal carbohydrate metabolism. Two of the patients developed clinical signs of pellagra when the carbohydrate content of the diet was increased and added insulin was given. The glossitis and mental symptoms were controlled by nicotinic acid. In the other patient both riboflavin and nicotinic acid were required for improvement in the symptoms of avitaminosis. The rapid metabolism of

carbohydrate brought about by the use of insulin is thought to have resulted, in the cases reported, in a rapid depletion of coenzymes.

**Determinations of ascorbic acid content of fruits and fruit products, some vegetables, and other plants** [trans. title], E. JOHANSSON (*Årsskr. Alnarps Lantbr., Mejeri- o. Trädgårdsinst., 1939, pp. 53, figs. 2; Eng. abs., pp. 48–52*).—Ascorbic acid, as determined by titration with 2,6-dichlorophenolindophenol, is reported for about 150 varieties of apples, 50 of pears, 25 of plums, 9 of cherries, and a number of varieties of gooseberries, currants, raspberries, and strawberries; values are also reported for rose hips and fruits of *Cotoneaster, Crataegus, Sorbus, Berberis,* and a few other plants including rhubarb. Most of the fresh fruits were analyzed at the most suitable stage of ripeness. Among the vegetables, data are reported for potatoes (raw and cooked), tomatoes, radishes, cucumbers, and lettuce. Nearly all of the material analyzed was grown at Alnarp.

**The photochemical decomposition of ascorbic acid in black-currant syrup,** H. T. FAWNS (*Jour. Soc. Chem. Indus., Trans., 58 (1939), No. 5, pp. 193, 194*).—The process followed in making black-currant sirup on a commercial scale is outlined, and data are reported on the ascorbic acid content of samples of the sirup kept for nearly a year in the light and dark at room temperature and in a refrigerator and on the losses of ascorbic acid in sirup kept in bulk storage in the dark for 435 days and a sample from the same lot kept in the light for 152 days. Color measurements were made on diluted samples of this sirup at the same time as the ascorbic acid determinations.

The preliminary small-scale study showed a considerably lower content of ascorbic acid in the samples exposed to light than in those stored in the dark but with little difference between the latter and the sample kept in the refrigerator. The sirup used in the later tests had an original reduced ascorbic acid content of 80 mg. per 100 cc. Bulk storage in the dark resulted in an ascorbic acid loss of 14.7 percent, while storage in the light for a shorter period resulted in a loss of 21.7 percent. No reversibly oxidized ascorbic acid could be detected in the original sample, but values of 1.0 and 1.6 mg. per 100 cc. were obtained for the samples stored in the dark and light, respectively.

Noticeable fading of the sirup in the light was confirmed by the color tests, which showed total color losses of 19.2 percent in the dark and 38.3 percent in the light. The color pigment was composed chiefly of red, with a small admixture of yellow. It is thought that the dark color of the juice may act as a protective pigment for the vitamin.

The extremely high content of ascorbic acid in black currants and sirup has been reported previously by Olliver (E. S. R., 78, p. 430).

**One hundred and sixty days on a vitamin C-free diet: Observations on humans** [trans. title], H. RIETSCHEL and H. SCHICK (*Klin. Wchnschr., 18 (1939), No. 39, pp. 1285–1289*).—This report presents the case history of a man maintained on a diet of vegetables, cooked with soda, and fresh well-cooked meat for a period of 160 days. Erythrocyte and differential count, plasma ascorbic acid, and general physical condition were observed carefully over this period. The plasma ascorbic acid fell from 0.9 mg. percent at the beginning of the study to 0.5 mg. percent on the twenty-first day, then rather gradually to 0.15 and 0.05 mg. percent on the eighty-fifth and one hundred and sixteenth days, respectively, and remained at the lower level until the end of the experiment. No symptoms were observed that were considered indicative of scurvy. The behavior of this man and the experiences of the polar explorers Nansen and Stefansson that are cited are interpreted to indicate that such meat-containing diets must furnish at least traces of vitamin C. It is the opinion of the authors that ordinary diets are almost never deficient in vitamin C.

**The influence of nicotine on vitamin C metabolism** [trans. title], L. H. STRAUSS and P. SCHEER (*Ztschr. Vitaminforsch., 9 (1939), No. 1-2, pp. 39-48, figs. 5; Fr., Eng. abs., p. 47*).—Thirty healthy men and women from 18 to 40 yr. of age were used as subjects in this study of the effect of nicotine, as obtained from cigarette smoking, on ascorbic acid excretion. The subjects, in a state of vitamin C saturation, were given a test dose of 200 mg. of ascorbic acid and samples of urine collected immediately preceding the test dose and 1, 3, 5, 7, and 24 hr. after. The same subjects were tested without smoking and after smoking from one to three cigarettes. The smoking was followed by constant and marked reduction in urinary ascorbic acid. Similar results were obtained with vitamin $B_1$. The changes are thought to be related to the endocrine mechanism (thyroid and adrenal) and to the vegetative nervous system and to involve an increase of endocrine activity and a higher level of general oxidative processes.

**The vitamin C picture in blood and the question of vitamin C deficiency** [trans. title], W. v. DRIGALSKI (*Klin. Wchnschr., 18 (1939), No. 31, pp. 1056-1058*).—Long-time studies of 7-14 weeks' duration were made of the vitamin C content of the blood of several men of approximately the same age receiving the same institution diet poor in vitamin C. For different periods (8 days to 9 weeks) daily vitamin C supplements varying from 50 to 400 mg. were given orally, synthetic vitamin C or lemons serving as the supplement. The vitamin C determinations were carried out on 2 cc. of oxalated blood immediately after withdrawal by the method (slightly modified) of Farmer and Abt (E. S. R., 75, p. 588).

The results showed spontaneous variations in the blood picture of any one individual on a constant regime, the highest value obtained being as much as twice the minimum. Variations from person to person on the same regime were also noted, the average value on the vitamin C-poor diet being 0.2 mg. percent, 0.4, 0.2, 0.5, and 0.7 mg. percent, respectively, for the various individuals. During the course of the study all of the subjects suffered from infections similar to grippe, but neither the onset nor the course of the attack seemed to bear any relation to the vitamin C level, nor did the vitamin C level of the blood seem to be influenced by the infection. The blood picture was always low on the vitamin C-poor diet and high on the diet rich in vitamin C. It is considered that the most that can be claimed is that values over 1.0 mg. percent are indicative of a C-rich diet and those below 0.5 mg. percent of a C-poor diet, further distinctions not being tenable. It is concluded that individual variations in the vitamin C blood picture are not referable to diet but to constitutional differences in individual vitamin metabolism and that low vitamin C content of the serum cannot be considered as indicative of hypovitaminosis.

**The condition of the blood in malaria under treatment with vitamin C injection** [trans. title], I. GERDJIKOFF (*Klin. Wchnschr., 18 (1939), No. 36, pp. 1214-1217, figs. 7*).—Blood and temperature changes were followed in 12 malaria patients receiving 0.5 gm. of vitamin C daily (0.2 gm. by intramuscular injection and 0.3 gm. orally) and specific malaria therapy at given times. Reticulocyte and erythrocyte counts, hemoglobin percentage, percentage of hemolysis, and sedimentation rate were observed. The findings, presented by graph, are related to periods of vitamin and specific therapy and to the occurrence (above 5 mg. percent as representative of saturation) of vitamin C in the urine.

The results are interpreted as indicating that considerable vitamin C deficiency occurs in malaria, this retarding the usual increase in reticulocytes under specific therapy; that disturbances in the course of recovery can lead to renewed reticulocyte rise associated with increased need for vitamin C, as shown by

decreased elimination; and that in vitamin C-saturated cases, more quickly than in nonsaturated cases, the reticulocyte values tend toward normal after building up to a maximum. It is considered advisable, therefore, to employ vitamin C therapy along with specific therapy in the treatment of malaria.

**The influence of vitamin C (l-ascorbic acid) on immunity processes** [trans. title], H. J. JUSATZ (*Ztschr. Vitaminforsch., 9 (1939), No. 1–2, pp. 75–95*).—An extensive review, with numerous literature references.

**The vitamin-D potency of different fish and fish products,** V. ASCHEHOUG, H. KRINGSTAD, and G. LUNDE (*Jour. Soc. Chem. Indus., Trans., 58 (1939), No. 6, pp. 220–223*).—The oil obtained by ether extraction of the various fish and fish products was assayed for vitamin D potency. The method involved the radiographic measurement of the initial degree of rickets produced in rats on the Sherman and Pappenheimer diet and of the subsequent healing through calcification produced over a test period of 10 days by daily doses of 70–117 mg. of the test oil (diluted with peanut oil).

The 12 samples of "sild" sardines (small herring) packed in olive oil in tin and aluminum containers had a vitamin D potency in the extracted oil varying from 15 to 45 International Units per gram, equaling 390–1,000 I. U. per 100 gm. of the canned product. Storage apparently had no unfavorable influence, since some of the samples were 7–9 yr. old. The assay values for the other products calculated as I. U. per 100 gm. are reported as follows: Canned cod (*Gadus morrhua*) roe, 85; mackerel (*Scomber scombrus*) liver, 11,300; mackerel flesh, 1,100; red char (*Salmo alpinus*), salted, 1,120; tuna (*Thunnus thynnus*), ventral part, 1,570, dorsal part, 430; dogfish (*Squalus acanthias*) liver, 2,420; and shrimp (*Pandalus borealis*), 150 I. U.

## TEXTILES AND CLOTHING

***Diameter relationships of wool fibers from five breeds of sheep raised* in South Dakota,** B. BAILEY. (S. Dak. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *60 (1940), No. 6, pp. 415–426*).—Data are presented on average diameters and average fiber contour ratios of wool fiber samples from the shoulder, middle, and thigh regions of 11 Hampshire, 11 Southdown, 6 Rambouillet, 6 Shropshire, and 20 crossbred individuals. Wide variations in diameters existed between sheep within a breed and, in most instances, between breeds. Contour ratios were generally higher than 1:1.20. In about half the cases (except crossbreds) the fiber contour increased positively as fiber diameters of the various portions of the individual fleece increased. In 3 breeds standard deviation tended to increase as the contour increased, but no such relationship existed for the other 2 breeds. Sheep representing a breed were shown to be heterogeneous groups, so that it was impossible to report a single value for the breeds, with the possible exception of Shropshire.

**Quality control in a woolen mill,** W. VON BERGEN (*Amer. Dyestuff Rptr., 29 (1940), No. 4, pp. P84–P92, figs. 19*).—This general survey, presented as an address, indicates briefly the work done in the chemical, physical, and optical departments toward control of the wool as it changes from the raw stage and loose form into sliver, top, yarn, and fabric. The determination of shrinkage, fat, size, and acid content; control of light fastness; moisture determination; control of count, twist, strength, and abrasion; and grading of the wool are considered. Methods are outlined and the instruments are illustrated.

**Quality in cotton fabrics determined by research,** E. H. WHARTON. (U. S. D. A.). (*Forecast, 56 (1940), No. 4, pp. 186, 187, 224–226, figs. 5*).—This surveys briefly the work of the Bureau of Home Economics in determining physical

structure and durability of various cotton materials, in establishing quality guides and buying standards for cotton materials and manufactured cotton goods, in the study of waterproofing and crease-resisting processes, in developing hose designs, in improving the construction of cotton hose, and in studying various phases of the problem of more effective household utilization of cotton.

## MISCELLANEOUS

**Annual Report [of Florida Station], 1939,** W. Newell et al. (*Florida Sta. Rpt. 1939, pp. 195–VII, figs. 15*).—The experimental work not previously referred to is for the most part abstracted elsewhere in this issue.

**Nineteenth Annual Report [of the Georgia Coastal Plain Station], 1939,** S. H. Starr (*Georgia Coastal Plain Sta. Bul. 30 (1939), pp. 133, figs. 20*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

**Mississippi Farm Research, [June 1940]** (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 6, pp. 8, figs. 5*).—In addition to articles noted elsewhere in this issue, this number contains one entitled Varied Attacks Successfully Used for Control of Ants, by C. Lyle.

**Organization for agricultural research and problems under investigation: Forty-fifth Annual Report of the Montana Agricultural Experiment Station, [1938],** C. McKee et al. (*Montana Sta. Rpt. 1938, pp. 64, fig. 1*).—This gives brief statements regarding the functions of the various departments and substations, with a list of active projects and their objectives.

**Sixtieth Annual Report of the New Jersey State Agricultural Experiment Station and the Fifty-second Annual Report of the New Jersey Agricultural College Experiment Station for the year ending June 30, 1939,** W. H. Martin (*New Jersey Stas. Rpt. 1939, pp. [7]+183, pl. 1*).—The experimental work not previously referred to is for the most part noted eleswhere in this issue.

**Annual Report of [Puerto Rico College Station, 1939],** J. A. B. Nolla et al. (*Puerto Rico Col. Sta. Rpt. 1939, pp. XIII+102, figs. 22*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

# NOTES

**Georgia Station.**—A six-room brick building has been completed for the nutrition laboratory of the department of home economics. L. N. Skold has been appointed assistant agronomist for work with small grain and soybean breeding.

**Illinois University and Station.**—Additions to the staff include Dr. K. E. Gardner as associate in dairy husbandry extension; Dr. Nellie L. Perkins, associate professor of home economics; and the following assistants: L. D. Malotky in agricultural economics, E. G. Mosbacher in rural sociology, Julia Ann Franklin in soil survey publications, M. H. Nelson in soil experiment fields, S. W. Melsted in soil survey analysis, F. C. Francis in animal husbandry, U. S. Garrigus in animal genetics, and June Y. Foster in home economics.

**Maryland Station.**—A new set of buildings is being erected for station work with W. P. A. aid to cost approximately $30,000. A new building has been occupied by the poultry department. New greenhouses have also been completed, and experiments are in progress.

**Minnesota University and Station.**—Dean E. M. Freeman, head of the division of plant pathology and botany, relinquished administrative direction of the division on July 1 to Dr. E. C. Stakman, but is continuing as professor of plant pathology. A. J. Schwantes, acting chief of the division of agricultural engineering, has been appointed professor and chief.

**North Dakota Station.**—The station is cooperating with the State Water Conservation Commission and other agencies in conducting experimental work in irrigation on the Lewis and Clark Irrigation Project in the northern part of McKenzie County. Funds for the purchase of the land were obtained by the Williston Chamber of Commerce. The National Youth Administration is supplying labor and some materials, and the department of vocational agriculture in the Williston High School the immediate field supervision.

**Rhode Island Station.**—Andrew E. Stene, pomologist, retired effective August 31. Bradford D. Crossmon, assistant agricultural economist, resigned August 15. Recent appointments include Dr. Alexander Joss, Lyle M. Murphy, and Dr. Wendell L. Bartholdi as assistants in agricultural economics, pomology, and agronomy, respectively.

**Washington College and Station.**—Dr. R. E. Ward, acting assistant professor and assistant in dairy husbandry, has resigned to accept a position in Massachusetts. Recent appointments include Dr. Jennie A. McIntosh as nutrition chemist in the home economics division vice Ruth C. Robbins, resigned, and the following research assistants: F. J. Meade in animal husbandry vice William H. Burkitt, resigned; Dr. Robert J. Evans in poultry husbandry vice L. A. Wilhelm, resigned; J. Roberts in farm electricity vice W. A. Junnila, resigned; Clayton Plueger and Harris O. Van Orden in dairy husbandry; and Harold H. Dodge in entomology.

**Wisconsin University and Station.**—Leonard A. Salter, Jr., a senior agricultural economist in the Division of Land Economics of the U. S. D. A. Bureau of Agricultural Economics, has been appointed professor of agricultural economics, beginning September 1, and will give special attention to teaching and research in land economics.

**Wyoming Station.**—New station greenhouses are nearing completion. These greenhouses consist of three glass units, each 26 by 60 ft., and a head house

115 ft. long and 18 to 24 ft. wide. Two of the glass units are equipped with benches, while the third will be filled with soil to the ground level, a portion with selenium shales for use in studies of various selenium problems. One of the bench houses will be used for the testing of certified seed potatoes in tuber-index and hill-index work and the growing of potato seedlings. The remaining bench unit is for the use of research chemistry, botany, soils, and agronomy workers. The head house includes on the main floor a large workroom for general greenhouse work, a research laboratory, and a classroom, with adjacent storerooms or workrooms and an office. Beneath this portion are several cold-storage rooms, a room for caretakers, and a fumigation and steam-sterilization room. The central portion of the building will be higher and wider than the end wings, providing space for dry storage for seeds, grain, specimens for class use, and the like and connecting with the lower floor by stairs and elevator.

Robert F. Eslick and John F. Cykler have been appointed instructors in the department of agronomy and agricultural economics.

**University of the Philippines.**—Dr. N. B. Mendiola, professor and head of the department of agronomy, has been appointed director of research in the College of Agriculture. Dr. Leon G. Gonzalez has been appointed acting head of the department of agronomy.

**V. R. Williams Prizes.**—According to a note in *Nature*, the Timiryazev Agricultural Academy in Moskva has founded three prizes in memory of the late Prof. V. R. Williams. These prizes are 5,000, 3,000, and 1,500 rubles, respectively, and are to be awarded annually for work on soil study and cultivation.

**Journal Changes.**—The publication of *Chronica Botanica* has been transferred from the Netherlands to the United States. The journal will contain the same type of material as formerly, but will be published fortnightly. Its editor, Dr. Frans Verdoorn, will continue in charge, his address being P. O. Box 151, Waltham, Mass. Announcement is further made that his new series of Plant Science Books is also being continued, and that the first American list will be issued early in 1941.

*International Bulletin of Agricultural Law* is being issued by the International Institute of Agriculture at Roma, supplementing *Annuaire International de Législation Agricole* by discussions of important agricultural measures and their judicial interpretation. The opening article in the initial number is entitled All-Risk Wheat Crop Insurance in the United States of America Under the Federal Crop Insurance Act of 1938, by R. H. Shields and H. Donoho.

*The Virginia Journal of Science* is being published monthly from October to May, inclusive, at Charlottesville, Va., as the official journal of the Virginia Academy of Science. The botanical journal *Claytonia* has been merged with it, and it is hoped to include other phases of sciences. The initial number contains as its leading article Mixed Deciduous Forests of the Appalachians, by E. L. Braun.

*Revista de la Sociedad Mexicana de Historia Natural* is being published quarterly by the Mexican Society of Natural Science at Apartado Postal 1079, México, D. F. Among the articles in the initial number is one on the Introduction of Para Grass Into Mexico, by G. Itie.

Owing to a shortage of paper, it has been decided to suspend the publication of the *Cyprus Agricultural Journal* for the present.

EXPERIMENT STATION RECORD

VOL. 83 DECEMBER 1940 No. 6

## DEAN MUMFORD'S EVALUATION OF THE LAND-GRANT COLLEGE MOVEMENT

Some months ago the suggestion was made in these columns (E. S. R., 82, p. 433) of the desirability of utilizing in agricultural historical research "competent persons no longer available for full-time employment." A striking illustration of the possibilities in this direction is now at hand following the publication as Bulletin 419 of the Missouri Experiment Station of a unique contribution from the pen of Dean and Director Emeritus Frederick B. Mumford. This publication was undertaken by him when he retired in 1938 because of the university age limit for regular service. The bulletin contains 140 pages, is entitled "The Land Grant College Movement," and is announced as the first of what it is hoped will be a series which he will prepare covering the field of agricultural education.

Dean Mumford states that he "has not attempted to write another history or duplicate the many excellent treatises relating to the land-grant colleges and universities." Attention has rather been concentrated on "the underlying philosophy of the colleges of agriculture and their influence upon the social, intellectual, and economic life of rural people and the public generally." Some effort has also been made "to evaluate the influence of the land-grant college and university on all education."

For the task thus undertaken, the author "claims no special qualification," although acknowledging that he has been "associated with colleges of agriculture for 50 years as student, instructor, and dean and director," and that during this period he has been "permitted to be an active participant in an educational movement of major importance." An introduction to the bulletin by Dean and Director M. F. Miller adds to this modest statement the well-recognized fact that Dean Mumford "is one of those men who has been very influential in determining the remarkable development of these institutions," and that he "brings to the task of evaluating the work of the land-grant colleges not only a great faith in their future, but a wealth of administrative experience in the field of agricultural education and a knowledge of these institutions possessed by very few men. It



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is his exceptional familiarity with this entire field that makes his statements authoritative."

The material in the bulletin is arranged in four parts. Of these, part 1, The American Land Grant College, discusses the legislation establishing these institutions, their objectives, early struggles and criticisms, the evolution of the agricultural curriculum, and the relation which this group bears to vocational education and to liberal culture. Part 2, Development of the Land Grant Colleges, takes up such matters as requirements for admission, experience with the manual labor requirement, motives and underlying spirit activating the colleges, their contribution to economic life and to society, Federal relations and Federal-State cooperation, and the Association of Land-Grant Colleges and Universities. Part 3 is devoted to the agricultural experiment stations, and part 4 to the agricultural extension service. This arrangement subordinates chronology to functional organization and has many advantages in a critical evaluation of this type.

Dean Mumford finds that from very humble beginnings, considerable opposition and misunderstanding, and much groping and uncertainty, the American land-grant college has come to occupy "a position of exceptional influence and popularity in our modern life. It is unique among educational institutions of the United States in its insistence upon democracy in education; its close cooperation with a basic industry; the completeness of its educational program; its reliance upon scientific research; the training of its students to prepare them for specific and practical service; its comprehensive program of adult education of a kind which is directly usable by the farmer and his family; its direct relation to government; its interest in the common affairs of life; its great contributions to the conservation of our natural resources; its recognized leadership in the progress, development, and permanent improvement of the rural population; and indirectly, but no less certainly, its contribution to the broader purpose of the public welfare." Among the fundamental reasons for the rapid development, continued progress, and present popularity and approval of these institutions, he enumerates the major objectives of their educational program, their plan of organization, their Federal origin and the successful cooperation of the Federal and State governments, and their effectiveness in administration.

Readers of the *Record* will find much of immediate interest in the section on the experiment stations. Dean Mumford points out that the passage of the Hatch Act of 1887 represented "an entirely new governmental policy; it was the recognition of the responsibility of the Federal Government for the progress and development of the

agricultural industry through research. It was also a recognition of the developing importance of science in the national economy. The results of this legislation, after 50 years of experience, have fully justified the faith of the founders in the value of science for solving the problems of the farm, and in the economic and social returns from the activities of these agencies. The discoveries of the agricultural experiment station have had a profound influence upon agriculture as an industry, the economic and social life of farm people, the commerce in agricultural commodities, and upon education itself." When coupled with the work of the Federal Department of Agriculture and its hundreds of cooperative agreements with the individual States, "it is not too much to claim that this national *system of scientific research in the interests of agriculture is an* educational phenomenon without parallel in the history of science."

Among the distinctive services of the stations has been their emphasis on "the value of science as an instrumentality for the successful solution of the problems of agriculture. 'Science for the sake of science' is not a principal motive in agricultural research. The experiment station has revolutionized the attitudes of farm people toward the practical values of scientific research in the modern world. From an attitude of suspicion and even antagonism toward science, these agencies have won the enthusiastic support and approval of farmers, the most conservative element in our democracy; and along with this, the approval and support of the public generally. They have popularized science not by any superpublicity methods but by utilizing science as an instrument to solve the intricate and difficult problems of agriculture. This has been a real contribution to all science."

One aspect which receives considerable attention in the discussion is *the relation of Federal control to the administration of station* research. On this point, Dean Mumford states in part that "it must be admitted, I think, that the administrative relation of the Secretary of Agriculture to the research funds appropriated by Congress has been exercised with discretion. No attempt has been made to dominate or control the work of agricultural experiment stations. The minimum amount of administrative supervision has been the rule. As a result of this policy, local initiative has been encouraged. Proper emphasis has been placed on the solution of local and regional problems. The State institutions have been able to harmonize the use of Federal funds with State laws and institutional requirements. After 50 years of experiment with this type of successful and satisfactory Federal administration, the State administrators of agricultural experiment stations have expressed general satisfaction with the results."

As for the agricultural experiment station of the future, it is pointed out that this "has a broad duty to perform. It is not only to make individual farmers more successful. It is not, as some thoughtless persons have claimed, 'to make two blades of grass grow where but one grew before.' Its duty is much broader and more important. It has the duty and responsibility of insuring the permanency of agriculture as an industry and the continued well-being of rural people. It must accomplish this purpose in such manner as to also serve the public welfare. If this can be accomplished—and it can be and is already being achieved—the agricultural experiment station will justify its national origin and more firmly establish its national destiny."

Not only was the land-grant college "a pioneer in its emphasis on scientific research as an instrumentality for the solution of the common everyday needs of farm people," it was also "a pioneer in the organization and administration of a special type of extension teaching, not for college credit but for immediate use in the everyday life of a people." Dean Mumford finds that "the impact of the work of the agricultural extension service on the farm practices, intellectual and social life of farm peoples has been very great." Through this service, "the college of agriculture has made it clear that the influence of an institution of higher learning may extend far beyond the limits of the college campus. The program of adult education, intelligently organized and efficiently administered, has influenced more adult people and changed more practices than any similar educational movement in all history."

In conclusion, Dean Mumford attributes the notable progress of the colleges of agriculture as a whole largely to the completeness of their educational plan. "The college education prepares young men and women for successful achievement in rural affairs; the agricultural experiment station utilizes the methods of science for adding constantly to our store of knowledge relating to agriculture; and the agricultural and home economics extension service has assumed the responsibility of educating the farmer and his family by extending the influence of the college to all engaged in agricultural enterprise. This triad of education has made the college of agriculture what it is and is an important factor in the widespread approval of these institutions." He predicts that "it may well be that when the history of the colleges of agriculture is finally written, their substantial and enduring contribution will be a significant improvement in every phase of rural life and especially the rural community and the rural home. If it be so, then it will be also a great contribution to the national welfare."

# RECENT WORK IN AGRICULTURAL SCIENCE

## AGRICULTURAL AND BIOLOGICAL CHEMISTRY

**[Chemical investigations by the Massachusetts Station]** (*Massachusetts Sta. Bul. 369 (1940), pp. 28, 29, 31, 32, 33, 73, 74, 75, 76*).—The report notes analyses of off-flavored eggs, flotation sulfur, a roach powder, and lubricating oils; methods for the determination of zinc in foodstuffs; studies on the effect of borax in preventing dark centers in rutabagas, by E. B. Holland, W. S. Ritchie, and C. P. Jones; lignin and its relation to the absorption of minerals by plants, by E. Bennett; and an investigation of the progressive decomposition of haddock muscle, by Ritchie and P. N. Simon. Also noted are cranberry storage and byproducts research, by C. R. Fellers, A. S. Levine, F. Yourga, and J. Lubitz; work on the antiseptic action of acetic acid, by Levine; and glass-container research, by Fellers and K. R. Newman.

**The infra-red absorption spectra of amino acids,** N. Wright (*Jour. Biol. Chem., 127 (1939), No. 1, pp. 137–141*).—Differences among the infrared absorption spectra of powder layers of nine different amino acids, and of five of these acids both in the racemic form and in an optically active form, in the range from 3$\mu$ to 24$\mu$ have shown that in each case the racemic form, as crystallized from solution, is a compound, not a mixture of *l*- and *d*-crystals.

Shifts in the position of the C=O band indicated a strong interaction between carboxyl and amino groups in the crystalline amino acids.

**A rapid micromethod for the quantitative estimation of sugar alcohols,** W. R. Todd, J. Vreeland, J. Myers, and E. S. West (*Jour. Biol. Chem., 127 (1939), No. 1, pp. 269–273*).—The ferricyanide method of Hagedorn and Jensen (E. S. R., 74, p. 590) was so modified that it could be applied to the determination of sorbitol, mannitol, dulcitol, erythritol, pentaerythritol, and inositol, and probably to the other sugar alcohols. By determining reducing sugars, which react with the ferricyanide reagent if they are present in determinable quantities and also affect the sugar-alcohol equivalents, from 0.1 to 0.7 mg. of sugar alcohols in 5 cc. of solution may be determined in properly clarified filtrates of blood, urine, etc.

**Determination of cholesterol,** F. E. Kelsey (*Jour. Biol. Chem., 127 (1939), No. 1, pp. 15–22, fig. 1*).—A micromethod for quantitative isolation of the digitonin-precipitable sterols from biological samples permits an accurate colorimetric analysis showing the true cholesterol content of the sample, because of the absence of the naturally occurring contaminants which usually affect the Liebermann-Burchard reaction. Both free and total cholesterol analyses can be made on the same sample.

**The dissimilation of glycerol by coli-aerogenes intermediates,** M. N. Mickelson and C. H. Werkman. (Iowa State Col.). (*Jour. Bact., 39 (1940), No. 6, pp. 709–715*).—In a study of glycerol fermentation by several species of *Citrobacter*, the yields of trimethylene glycol varied from ±30 to 60 percent of the fermented glycerol. Isolation of acrolein and its possible importance in the fermentation process is discussed. The effect of adding sulfite as a fixative

and fumaric acid as an H acceptor was determined. Sulfite did not diminish the formation of trimethylene glycol and in its presence considerable acrolein accumulated. The latter was not attacked when added to fermenting glycerol. Fumaric acid, though reduced, did not retard trimethylene glycol formation.

**Extraction methods in relation to hormone content of maize endosperms,** G. S. Avery, Jr., H. B. Creighton, and B. Shalucha (*Amer. Jour. Bot., 27 (1940), No. 5, pp. 289–300, figs. 3*).—In studying comparatively the various proposed methods for single-solvent extraction and using dormant corn endosperms and those removed from germinating seeds at intervals up to 7 days, wide differences in yield of growth hormones were obtained, depending on the solvent and the extent of hydration of the tissue. The water and alcohol extraction methods gave the most reliable results. Water gave the highest yields and proved to be the only method not involving drying down of the residue. Only preliminary studies were made of the extent to which growth inhibitory substances were involved in the yields reported. In general, the amounts of extractable growth hormone decreased as germination proceeded. Multisolvent extraction is proposed for assaying total hormone content. This method of successive extractions of the same tissue with several solvents indicated that not all growth-promoting substance (or substances) is extracted by any one solvent. Some of the difficulties and uncertainties met with in hormone extraction are discussed. There are 20 references.

**Microincineration and ash analysis,** F. M. Uber. (Univ. Mo.). (*Bot. Rev., 6 (1940), No. 5, pp. 204–226*).—This monographic review (74 references) deals with technical factors, including the preparation of material, the incineration process, and ash observation and analysis, and the results as applied to systematic botany, cytology, and phytopathology.

**Spectroscopic analysis of the mineral content of yeast grown on synthetic and natural media,** O. W. Richards and M. C. Troutman (*Jour. Bact., 39 (1940), No. 6, pp. 739–746*).—"A pure strain of *Saccharomyces cerevisiae* was grown in Williams' medium, in Williams' medium enriched, and in malt extract medium. After washing, the yeasts were ashed in platinum and spectroscopic plates were made of them and of the components of the medium, of autolyzed yeast, and yeast extract to determine which elements were present. The following elements were found in the yeast ash: Ba, Bi, B, Ca, Cr, Cu, Au, Fe, La, Pb, Mg, Mn, P, Pt, K, Ag, Na, Tl, Sn, and Zn. Autolyzed yeast contained Al in addition. The elements in the different preparations are given with information on their toxicity. Most of the trace elements were present as impurities of the asparagine and these impurities may be a more important reason for the growth-promoting value of asparagine for micro-organisms than its nitrogen content."

**A method for the determination of small amounts of potassium,** T. E. Weichselbaum, M. Somogyi, and H. A. Rusk (*Jour. Biol. Chem., 132 (1940), No. 1, pp. 343–356, figs. 2*).—The method described is based upon the precipitation of potassium as silver potassium cobaltinitrite, with subsequent manometric determination of nitrite, and titrimetric determination of silver by the use of the Volhard procedure. Special precautions are noted with regard to the purity of the reagents and the equilibrium conditions. For estimation on blood serum special care must be observed in taking and handling the blood sample in order to avoid passage of potassium from corpuscles to serum. Preparatory to the precipitation of the potassium, the serum may be wet ashed or proteins and chlorides may be removed by use of the cupric sulfate-sodium tungstate method. These procedures, as well as those involved in the precipitation of potassium and the determinations of nitrite and silver, are noted in detail.

The results obtained by the gasometric and the titrimetric determinations were in good agreement; the two procedures are considered interchangeable, the gasometric technic being preferable for its precision, the titrimetric for the ease and rapidity of performance. Results by the gasometric technic compare very favorably with those obtained by a reliable chloroplatinate method, and recovery experiments indicate that no losses occur with the operations involved.

Values reported for the serum potassium content of 40 healthy individuals show a range from 18 to 20.6 (average 19.3) mg. percent.

**A new method for the microdetermination of manganese in biological materials**, A. C. Wiese and B. C. Johnson. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 127 (1939), No. 1, pp. 203–209*).—The authors showed that the blue color produced by benzidine in the presence of the permanganate ion, though it is an exceedingly sensitive qualitative test for manganese, fades so rapidly as to be useless in photometric analysis. However, when solutions of benzidine were added to permanganate solutions made strongly acid with nitric acid, a yellow-green color instead of the blue was obtained. In tests of this color with the photoelectric colorimeter, with a 4,200-a. u. filter, it was found to be a great deal more stable. The maximum color develops in 3–5 min. and is stable for 5 min. The method utilizing the yellow-green color and providing for the elimination of oxidizing agents other than the permanganate ion, as well as for the removal of halides which also interfere, was elaborated. Sodium bismuthate was used as oxidant, and the use of silver nitrate, which resulted in a soluble complex of silver bismuthate and brought about an interference, was eliminated through expelling halides by repeated evaporation with nitric acid. The metals found to interfere with the benzidine blue reaction did not interfere with the modified reaction used as a basis for the present method.

**The selenium content of Saskatchewan wheat**, T. Thorvaldson and L. R. Johnson (*Canad. Jour. Res., 18 (1940), No. 5, Sect. B, pp. 138–150, figs. 3*).—The average selenium content of 230 composites made from 2,230 samples of pure varieties of wheat from Saskatchewan soils of known type was 0.44 p. p. m. The maximum was 1.5 p. p. m. and was found in 10 of the 230 composites, representing 3.2 percent of the individual samples. It is thought that methods used in bulk handling of wheat for export would prevent the Se content of such cargoes materially exceeding the average content, which is less than one-tenth the minimum concentration found to affect growth in young animals. The results indicate that wheat produced on glacial lacustrine soils tends to higher Se content.

**The preparation of a vitamin-A rich concentrate from butter and the determination of the vitamin in a Pulfrich photometer** [trans. title], J. Effern (*Vorratspfl. u. Lebensmtl. Forsch., 3 (1940), No. 1–2, pp. 53–58, figs. 7*).—One hundred gm. of butter in a 500-cc. Erlenmeyer flask fitted with an upright condensing tube are saponified by heating for 15 min. on a boiling water bath with 150 cc. of alcoholic potash (30 gm. caustic potash in 150 cc. of 96 percent alcohol). The reaction mixture amounting to 270 cc. is halved for duplicate determinations, which are carried out in succession.

The half of the saponification mixture is shaken in a separatory funnel with 150 cc. of petroleum ether, and extracted 3 times with alcohol. The alcohol is removed from the combined extracts by distillation in vacuum, and the residue is taken up in chloroform (water- and alcohol-free). Carotenoids and any lecithin present are removed from this chloroform concentrate by adsorption on precipitated calcium carbonate. A diagram of the adsorption apparatus is given, and the procedure is described. This consists essentially in permitting the chloroform solution, placed in a separatory funnel under an atmos-

phere of nitrogen or carbon dioxide, to be drawn, by application of vacuum, through a closely packed column of the calcium carbonate. A column 10 cm. in length and 1 cm. in diameter suffices for adsorption of 50 cc. of the concentrate. After adsorption, a 0.5-cc. portion of the chloroform concentrate is treated with 2 cc. of the Carr-Price reagent in the cell of the Pulfrich photometer, and after 5–10 sec. the percentage of light transmission is determined, using the S 61 filter. This filter permits transmission in the region of 610-620 m$\mu$ where the characteristic absorption band of the antimony trichloride reaction occurs. The amount of vitamin A (International Units) in the 0.5 cc. of the concentrate employed is read off from a standard curve of light transmission established with pure vitamin A (Vogan). This curve and one established for the Erdelyi modification of the Carr-Price reaction are presented.

This modification is applicable in the presence of carotenoids and in the absence of lecithin; it employs 1.0 cc. of a 5 percent solution of pyrocatechol in chloroform, with 1 cc. of the antimony trichloride reagent and 0.5 cc. of the vitamin solution (or the chloroform concentrate), and the reaction mixture is heated at 60° C. for 3 min. The color developed shifts from the blue to the violet red region, necessitating use of the S 47 filter. If lecithin is absent, as indicated by lack of turbidity of the chloroform concentrate, this modification may be employed directly without preliminary adsorption on the calcium carbonate.

The vitamin A content, as determined by the methods outlined, is reported for 11 samples of butter, the amounts varying from 0.68 to 2.06 mg. percent (1,140–3,440 I. U. per 100 gm.). One sample of margarine contained 0.048 mg. percent (80 I. U. per 100 gm.).

**The purity and activity of vitamin A preparations** [trans. title], P. Karrer (*Helvetica Chim. Acta, 22 (1939), No. 5, pp. 1149, 1150*).—Referring to the work of Mead, Underhill, and Coward (E. S. R., 83, p. 297) on crystalline esters of vitamin A, the present article points out as a matter of priority that certain of these esters had been prepared and described earlier by Karrer et al. (E. S. R., 68, p. 151). Evidence is presented to show that the vitamin A preparation (Axerophtol) of Karrer purified by chromatographic separation, the product of Mead et al. purified by distillation and recrystallization from methyl alcohol at a low temperature, and the crystalline product of Holmes and Corbet (E. S. R., 77, p. 150) [purified by fractional freezing from methyl alcohol and cold filtration] had similar properties and were, therefore, of equal purity.

**Studies on the determination of vitamin A by destructive irradiation,** B. Demarest (*Ztschr. Vitaminforsch., 9 (1939), No. 1–2, pp. 20–31, figs. 6; Ger., Fr., abs., p. 31*).—Absorption curves made at intervals during the irradiation of solutions containing vitamin A were studied to determine the validity of destructive irradiation methods, as proposed by De [1] and by Chevallier.[2] By the former method solutions of food extracts or low-potency oils are irradiated with the total irradiation of the quartz mercury arc until the vitamin is completely destroyed. The decrease in extinction at 3,280 a. u. is then taken to be equal to the extinction at 3,280 a. u. of the vitamin A originally present in the solution. This method assumes (1) that the vitamin A is thus destroyed, yielding no end products having absorption at 3,280 a. u.; (2) that substances present other than vitamin A do not change in their absorption at 3,280 a. u. during irradiation; and (3) that the irradiation is continued long enough to insure destruction of all of the vitamin A present in the solution. The present

[1] Indian Jour. Med. Res., 24 (1937), No. 3, pp. 737–749.
[2] Ztschr. Vitaminforsch., 7 (1938), No. 1, pp. 10–16.

investigation showed that with solutions of high-potency vitamin A concentrates the vitamin A was almost entirely destroyed, a 98 percent loss in extinction at 3,280 a. u. resulting, with no increase in the extinction at any other part of the ultraviolet spectrum during irradiation. With low-potency fish-liver oil solutions, however, the destruction of the vitamin by total mercury arc radiations was much slower than in the case of the high-potency material, due apparently to the screening effect of other substances present; moreover, there were other changes in the absorption spectrum which did not occur with the high-potency oils. These results, which did not bear out assumptions (2) and (3), indicated that the total mercury arc spectrum did not exert selective destruction of vitamin A. In addition, the change in the absorption spectrum of an irradiated milk extract was radically different from the change that should have resulted from a selective destruction of vitamin A.

In other irradiation experiments employing filters having various ultraviolet transmission limits, it was found that short wave length ultraviolet mercury lines were much more effective than the long wave length lines, both in the destruction of vitamin A and in producing the extraneous photochemical reactions. By filtering out the shorter wave length ultraviolet mercury lines, this latter effect could possibly be retarded or eliminated. The use of a Woods filter, as in the Chevallier method, offered the probability of a more selective destruction of vitamin A. The equilibrium point claimed for the Chevallier method was not attained, however, in the present experiments in which an absolute ethyl alcohol solution of a high-potency material was irradiated with the mercury arc and Woods filter. No equilibrium point was found for the extinction at 3,280 a. u. down to a value of 16 percent of the original extinction at this wave length. While the results indicate that there are objections to the De and Chevallier methods for the determination of vitamin A, it is considered that irradiation by filtered radiation offers a promising avenue of investigation.

**The determination of vitamin A and carotene with the photoelectric colorimeter,** C. J. KOEHN and W. C. SHERMAN. (Ala. Expt. Sta.). (*Jour. Biol. Chem., 132 (1940), No. 2, pp. 527–538*).—The procedures and the calculations involved in the determination of vitamin A, employing the Carr-Price reaction, and of carotene by the use of a direct reading photoelectric colorimeter are given in detail. The relationship between $L^{1\%}_{1\,cm.}$ (620 mμ) and biological activity in terms of units of vitamin A was determined. For this purpose the $L^{1\%}_{1\,cm.}$ (620 mμ) of the U. S. P. reference cod-liver oil was determined (and found to be 3.45) and the potency of the oil then checked by biological assay against β-carotene. This reference oil was found to have the assigned potency of 3,000 International Units.

The calculations for converting the colorimetric reading, i. e., galvanometer readings, using filters 620 and 440, respectively, into I. U. of vitamin A and micrograms of carotene, are presented. The $L^{1\%}_{1\,cm.}$ (440 mμ) of β-carotene was determined as 1,645 and 1,980 in chloroform and Skellysolve solutions, respectively. From the results of the biological assays, the determined value of 3.45 for $L^{1\%}_{1\,cm.}$ (620 mμ) of the U. S. P. reference oil and factor 0.41 suggested by Dann and Evelyn[3] for converting $L^{1\%}_{1\,cm.}$ (620 mμ) into $E^{1\%}_{1\,cm.}$ (328 mμ), a factor of 2,120 was obtained for converting $E^{1\%}_{1\,cm.}$ (328 mμ) into I. U. of vitamin A.

**Comparison of vitamins A and $A_2$ by distillation,** E. L. GRAY (*Jour. Biol. Chem., 131 (1939), No. 1, pp. 317–326, figs. 7*).—Molecular distillation characteristics of vitamins A and $A_2$ were compared. The comparison was made in a single distillation of both vitamins as they occurred in the unsaponifiable fraction of Atlantic salmon-liver oil. Check distillations were made on liver oil of

[3] Biochem Jour., 32 (1938), No. 6, pp. 1008–1017, figs. 3.

wall-eyed pike for vitamin $A_2$ and on pollack-liver oil for vitamin A, the oils being saponified and distilled analytically with celanthrene red. By the elimination curve technic employed, it was found that the elimination maximum of vitamin $A_2$ was only 3° above that of vitamin A. Since the temperatures of the elimination maxima of homologous compounds differ by only 10°, this small difference observed in the distillation temperatures indicates that the molecules of the two vitamins contain the same number of carbon atoms and differ only in the degree of saturation.

**Cyclization of vitamin $A_2$,** N. D. EMBREE and E. M. SHANTZ (*Jour. Biol. Chem., 132 (1940), No. 2, pp. 619–626, figs. 3*).—Vitamin $A_2$ in the unsaponifiable matter of perch-liver oil was cyclized by dissolving this portion in alcohol, making the solution $\frac{1}{30}$ N with HCl and allowing it to stand at room temperature for 15 min. The solution, after neutralization with aqueous NaOH and dilution with water, was extracted with ether. The cyclized vitamin $A_2$ obtained as the residue from the ether extract had, like the cyclized vitamin $A_1$, an ultraviolet absorption spectrum with maxima at 350, 368, and 390 mμ. The product formed by the reaction of cyclized vitamin $A_2$ with $SbCl_3$ had, like the vitamin $A_2$, an absorption spectrum with a maximum near 690 mμ. The cyclized vitamin $A_2$ was more strongly adsorbed by alumina than cyclized vitamin $A_1$, thus permitting the chromatographic separation of the two cyclized derivatives. Based on this separation, a method is outlined for the estimation of relative amounts of vitamins $A_1$ and $A_2$.

**Preparation of vitamin $B_6$ from natural sources,** R. D. GREENE (*Jour. Biol. Chem., 130 (1939), No. 2, pp. 513–518*).—The method described for preparation of the crystalline vitamin involved an initial concentration from an aqueous rice bran extract by employing immiscible solvent systems. Preliminary determination of distribution coefficients of pure vitamin $B_6$ in a number of such systems indicated that propanol, butanol, and ethyl ether, the latter particularly, were very useful as selective solvents. In order further to remove readily adsorbable substances that would interfere with fuller's earth adsorption of the vitamin, concentrates were treated with silver and copper salts which served to remove purines and nicotinic acid. From the concentrate thus derived, the vitamin $B_6$ was adsorbed on Lloyd's reagent and eluted with 0.2 N barium hydroxide. After adjustment of the pH to 3 (using sulfuric acid and barium chloride and removing the barium sulfate by centrifugation), the aqueous solution was concentrated to a thick sirup and taken up in boiling absolute alcohol; after cooling and removal of insoluble material, the alcoholic solution was evaporated and taken up in boiling acetone, from which crystallization occurred, the second crop of crystals being obtained from the mother liquor by the addition of ether. Recrystallization from absolute alcohol gave crystals that melted at 207°–208° [C.], gave an intense red-brown color with the ferric chloride reagent, showed strong absorption in the range of 2,750–3,070 a. u., and gave a positive response in the biological test for vitamin $B_6$. Yields of 10–15 percent were obtained.

**The determination of vitamin C in urine,** H. N. HOLMES and K. CAMPBELL (*Jour. Lab. and Clin. Med., 24 (1939), No. 12, pp. 1293–1296*).—The addition of a slightly rounded teaspoonful (about 3 gm.) of precipitated calcium carbonate and a fragment of marble the size of one or two grains of corn (about 2 gm.) to a 500-cc. bottle of fresh urine into which 50 cc. of glacial acetic acid had previously been measured is suggested as a means of preventing oxidation of ascorbic acid in samples of urine collected for ascorbic acid determinations. Directions are given for the titration procedure.

**Standardization of 2,6-dichlorophenolindophenol with ferrous compounds**, A. J. LORENZ and L. J. ARNOLD (*Indus. and Engin. Chem., Analyt. Ed., 10 (1938), No. 12, p. 687*).—The use of ferrous ammonium sulfate (Mohr's salt) in the presence of metaphosphoric acid or oxalic acid is suggested as a basic standard for the titration of 2,6-dichlorophenolindophenol. The solution is made up, using 1 gm. of the ferrous salt and 10 cc. of concentrated sulfuric acid in 1 l. To 2–5 cc. of this solution are added 5–10 cc. of a saturated solution (about 4 percent) of oxalic acid or a 3 percent solution of metaphosphoric acid. One mg. of $FeSO_4(NH_4)_2SO_4.6H_2O$ is equivalent to 0.2247 gm. of ascorbic acid.

***On the mechanism of cocarboxylase action***, K. G. STERN and J. L. MELNICK (*Jour. Biol. Chem., 131 (1939), No. 2, pp. 597–613, figs. 4*).—This study was concerned with an investigation of two possibilities suggested as the mechanism by which the coenzyme exerts its catalytic activity. The first of these was suggested by the model experiments of Langenbeck which had shown that primary amines were capable of decarboxylating α-ketocarboxylic acid. It seemed possible, therefore, that the amino group of the thiamin pyrophosphate (cocarboxylase) would function in the decarboxylation of pyruvic acid. In the present work it was shown, however, that thiamin is not a typical primary amine since it reacts with ketene to yield not an N-acetyl but an O-acetyl derivative and it does not readily give up its nitrogen in the Van Slyke manometric apparatus when treated with nitrous acid. Moreover, in an actual test of the cocarboxylase activity of thiamin as a model under the conditions employed by Langenbeck pyruvic acid failed to be decarboxylated.

As a second possibility it was suggested that the catalytic activity of cocarboxylase might involve a reversible reduction and oxidation of the double bond adjoining the quaternary nitrogen in the thiazole nucleus. In this study, however, it was found that neither dihydrothiamin nor dihydrococarboxylase is autoxidizable in vitro. These dihydro derivatives were prepared by several means, the reduction curves indicating different rates of reduction with the different conditions used. The dihydrothiamin tested for biological activity was found to have no antineuritic activty in pigeons. Dihydrococarboxylase, however, was highly active both in the pigeon and in the yeast test system. These findings suggested that the coenzyme in the course of its physiological function goes through an oxido-reductive cycle.

**Ultraviolet absorption spectra of cocarboxylase, thiamine, and their reduction products**, J. L. MELNICK (*Jour. Biol. Chem., 131 (1939), No. 2, pp. 615–620, figs. 2*).—The present measurements on the oxidized and reduced forms of thiamin and cocarboxylase were made with a view to their usefulness in demonstrating the occurrence of dihydrothiamin or its phosphorylated derivative in the tissues. A spectroscopic demonstration of the presence of these compounds would lend support to the view presented in the study noted above that the biological activity of thiamin pyrophosphate (cocarboxylase) depends upon the reversible oxidation and reduction of the coenzyme.

Ultraviolet absorption spectra of thiamin and cocarboxylase were measured under conditions in which the hydrion concentration was controlled either at pH 7.4 or at pH 2.3. Upon reduction of the vitamin or its pyrophosphate ester there occurred at pH 7.4 a lowering of the extinction at the maximum at 235–237 mμ, while the maximum at 265–266 mμ was lowered only slightly but was shifted to 280 mμ; at pH 2.3 the band at 243 mμ was still present, but it was lowered and not as sharp.

***Chemical determination, stability, and form of thiamine in urine***, D. MELNICK and H. FIELD, JR. (*Jour. Biol. Chem., 130 (1939), No. 1, pp. 97–107,*

*fig. 1*).—The determination is based on the specific method previously described (E. S. R., 83, p. 11), making use of the reaction in alkaline solution between the vitamin and diazotized *p*-aminoacetophenone. The urine, collected with acid-toluene preservative, is concentrated in vacuo and then subjected to benzyl alcohol extraction to largely eliminate salts which interfere with the subsequent permutite adsorption. The distillation unit for concentration of the urine is illustrated. Treatment of the alcohol extract with acidulated water and ether removes the vitamin to the aqueous phase from which it is adsorbed on permutite eluted with 25 percent KCl solution and treated with the reagent in an alkaline medium in the presence of thymol blue as an internal indicator; the colored vitamin derivative is finally extracted with xylene. A number of urine samples are run at one time, it being convenient to read the xylene layers of several unknowns against the xylene layer of the standard in a microcolorimeter.

The method applied to urines collected from six normal men during a 3-day period gave reproducible results with recoveries of added thiamin, averaging about 90 percent. In these six subjects thiamin in 24-hr. urine samples varied from 128 to 350 μg. The method is apparently specific for thiamin in urine, since a large number of drugs often administered in medication were found to give no interfering color reactions. Urine preserved with acid and toluene showed no decrease in thiamin over a 28-day period of storage, indicating the stability of the vitamin under these conditions. Likewise, there is apparently no destruction of the vitamin in bladder storage in vivo, since freshly voided urine adjusted to various pH levels over the physiological range and incubated for 6 hr. at 37.5° C. to simulate the conditions of the bladder showed no decrease in thiamin content. The vitamin is excreted in the urine entirely in the free form, since the method (which does not detect the phosphorylated vitamin) gave the same results before and after treatment of the urine with phosphatase, which would have liberated any bound vitamin. Moreover, only free thiamin was detected in the urine even after the injection of large amounts of the phosphorylated vitamin.

**A colorimetric method for the determination of nicotinic acid and nicotinamide in foodstuffs** [trans. title], H. Kringstad and T. Naess (*Hoppe-Seyler's Ztschr. Physiol. Chem., 260 (1939), No. 3–4, pp. 108–118, figs. 5*).—The reaction of nicotinic acid with cyanogen bromide and an aromatic amine to form a colored compound served as the basis of the method. Of the various amines studied, aniline proved most satisfactory. On the basis of preliminary studies, reported in detail, the following procedure was devised:

A portion of the finely divided substance was extracted 3 times by heating for 1 hr. on the water bath with 2–3 parts of water, the extracts being filtered off with suction. The combined extracts were treated with sulfuric acid to a concentration of about 0.1 N and heated for 2 hr. at 100° C., this hydrolysis serving to convert coenzyme, which was not reactive, to the amide; the acid was then neutralized with barium hydroxide and the barium sulfate removed by filtration. For determination of the amide the test solution was prepared by bringing a 20-cc. portion of the extract to a pH of ±6.3 by adding 5 cc. of a phosphate buffer solution and filtering off any precipitated phosphate. For determination of the acid another portion of the extract was treated with barium hydroxide (15 gm. per 100 cc. of extract) and heated on the water bath for 2 hr., this hydrolysis serving to convert the amide to the acid. The solution was then neutralized with sulfuric acid, and the precipitated barium sulfate removed by centrifugation and washed 3 times with 25-cc portions of water. The combined supernatant liquid and washings were made to definite volume and treated with phosphate buffer as above.

Determinations were carried out on 10-cc. portions of the test solutions, prepared as noted and containing 1γ–50γ per cubic centimeter, by adding 4 drops of a saturated solution of aniline in water, mixing, adding 0.35 cc. of cyanogen bromide solution (prepared according to Scholl[4] and Baum[5]) and mixing again. The development of the color was followed in the step photometer, using the S 45 filter. The reading at the point of maximum color development was applied to a standard extinction curve established for the nicotinic acid (or its amide), and the concentration of the constituent read off directly from the curve.

Dry brewers' yeast containing 44.0–45.5 mg. of nicotinic acid per 100 gm. and fresh beef liver containing 15.5–20 mg. per 100 gm. were found to be good sources of this constituent. Values of 10.2 and 11.0 mg. per 100 gm. are reported for moist brewers' and bakers' yeasts, respectively; and of 6.0, 5.0, 4.2, 4.9, and 3.3 mg. per 100 gm. of canned salmon, wheat bran, wheat germ, beef (flesh), and pork (flesh), respectively. Lower values (1–3 mg. per 100 gm.) are reported for cod (flesh, roe, and liver), herring (flesh), potatoes, whole rye meal, and corn. The results obtained were found to parallel the findings of Goldberger et al. in biological determinations of the P–P factor.

**The isolation of α-phylloquinone (vitamin K from alfalfa) and the history of its discovery** [trans. title], P. Karrer, A. Geiger, R. Legler, A. Rüegger, and H. Salomon (*Helvetica Chim. Acta, 22 (1939), No. 6, pp. 1464–1470, fig. 1*).—Previous work (E. S. R., 83, p. 298) dealt briefly with the isolation of vitamin K from alfalfa and with the physical and chemical behavior of the vitamin. The present paper gives a detailed description of the method used for the isolation, this method consisting of a combination of adsorption procedures and molecular distillation. Spectrographic study with particular reference to the determination of the coefficient of extinction for the wavelength 248 mμ served as the criterion for judging progressive purification of the preparations. The earlier descriptions of the α-phylloquinone were confirmed by the data obtained in the present study. Argument and evidence are presented in support of the conclusion that the preparation as isolated represented pure vitamin K; this is in refutation to the claim of Binkley et al. noted below that the product of Dam was only 50 percent pure.

**The isolation of vitamin K₁**, S. B. Binkley, D. W. MacCorquodale, S. A. Thayer, and E. A. Doisy (*Jour. Biol. Chem., 130 (1939), No. 1, pp. 219–234, fig. 1*).—Crude extracts of dried alfalfa meal or leaf meal were obtained by percolation with petroleum ether, this solvent being preferred since it removed the vitamin without removing excessively large amounts of solids. These crude preparations were purified by a modified chromatographic adsorption method employing one or two adsorptions on Decalso (a synthetic zeolite) which increased the concentration of the vitamin about 20–40 times; adsorption on permutite which gave a five- to tenfold concentration; further adsorption on a 5.0×580 cm. column of permutite to give a two- to fivefold concentration; and final adsorption on Darco (an activated charcoal), which was found to be advantageous with preparations containing more than 10 percent of the vitamin. Elution of the vitamin was effected with petroleum ether, followed by benzene in petroleum ether, and finally with acetone which served to prepare the adsorbent for future use. These several processes are described in detail and illustrated by a type experiment. The product isolated was purified by crystallization or molecular distillation and crystallization.

[4] Ber. Deut. Chem. Gesell., 29 (1896), No. 12, pp. 1822–1825.
[5] Ber. Deut. Chem. Gesell., 41 (1908), No. 3, pp. 523, 524.

The pure vitamin $K_1$ was converted by reductive acetylation into the diacetate of dihydro vitamin $K_1$ (m. p. 62°–63° C., potency 500 units per milligram). By means of the Grignard reaction the diacetate was converted back to vitamin $K_1$ with 100 percent enhancement of potency (1,000 units per milligram). Elementary analyses and molecular weight determination indicated a possible formula of $C_{32}H_{48}O_2$ or $C_{31}H_{46}O_2$. The analyses and the adsorption curve and extinction coefficient for the product isolated are discussed in comparison with the findings of Dam et al. (E. S. R., 82, p. 441) with respect to their product.

**Identification of vitamin $K_1$ (alfalfa)**, D. W. MacCorquodale, R. W. McKee, S. B. Binkley, L. C. Cheney, W. F. Holcomb, S. A. Thayer, and E. A. Doisy (*Jour. Biol. Chem., 130 (1939), No. 1, p. 433*).—This brief note reports that chromic acid oxidation of the synthetic diacetate of dihydro vitamin $K_1$ yields the same acid, 1,4-diacetoxy-2-methylnaphthalene-3-acetic acid, as is obtained by similar oxidation of the natural vitamin; the mixed m. p. (209°–210° [C.]) of the two products showed no depression. The isolation of this acid from the oxidation products is evidence that the nuclear structure, the positions of the substituents, and the location of the ethylenic double bond are the same in both the natural and synthetic compounds. Bio-assay of the natural and synthetic vitamin gave identical results and indicated a potency of 660 units per milligram.

**The constitution and synthesis of vitamin $K_1$**, D. W. MacCorquodale, L. C. Cheney, S. B. Binkley, W. F. Holcomb, R. W. McKee, S. A. Thayer, and E. A. Doisy (*Jour. Biol. Chem., 131 (1939), No. 1, pp. 357–370*).—This paper gives a full report (see preliminary communications (E. S. R., 83, pp. 586, 857, and above)) on the degradation and synthesis of vitamin $K_1$. The experimental procedures and results are described, and the implications discussed. It was shown that vitamin $K_1$ was a 2,3-disubstituted α-naphthoquinone with an unsaturated side chain. Oxidation of the vitamin with chromic acid yielded phthalic acid, indicating the presence of a benzenoid ring carrying no side chain. A second acid identified as 2-methyl-1,4-naphthoquinone-3-acetic acid was also obtained. This product indicated that the quinone nucleus carried a methyl group at the 2 position and, at the 3 position, a side chain with an ethylenic linkage between the second and third carbon atoms from the quinone ring. These conclusions were confirmed by the degradation products obtained from the diacetyl dihydro derivative of the vitamin. Ozonolysis or chromic acid oxidation of the diacetyl dihydro vitamin gave a ketone, $C_{18}H_{36}O$, which was identified as 2,6,10-trimethylpentadecanone-14, which proved the arrangement of the remaining carbon atoms of the unsaturated side chain. The constitution of vitamin $K_1$ as 2-methyl-3-phytyl-1,4-naphthoquinone was indicated by these results and confirmed by synthesis in which phytyl bromide was condensed with the monosodium salt of 2-methyl-1,4-naphthohydroquinone, the vitamin being isolated as the diacetyl dihydro derivative. The synthetic compound upon degradation by the same procedures as applied to the natural vitamin derivative gave the same degradation products.

**The blue alkali salt of α-phylloquinone (vitamin $K_1$) and similar compounds** [trans. title], P. Karrer (*Helvetica Chim. Acta, 22 (1939), No. 5, pp. 1146–1149*).—Argument is presented in favor of the view that the blue color reaction (E. S. R., 82, p. 441) obtained upon mixing solutions of vitamin $K_1$ and sodium alcoholate is due to the vitamin itself and not, as suggested by Fernholz et al. (E. S. R., 83, p. 14), to some impurity present. This blue color reaction is similar to the Liebermann reaction characteristic of naphthoquinones with a reactive -CH group as a substituent in the 2- or 3-position. With the postulation of a phytol residue (-CH₂.CH:CR′R″) in the molecule, it

appears probable that the $CH_2$ group of the side chain is activated by the adjacent ethylene linkage to give the reactive CH group responsible for the Liebermann reaction. A number of examples of such influence of the ethylene linkage are presented from the field of organic chemistry. It is noted that a *number of naphthoquinone derivatives with vitamin K activity have been* synthesized in the author's laboratory.

**Nor-α-phylloquinone (nor-vitamin $K_1$) and related compounds** [trans. title], P. KARRER, A. GEIGER, A. RÜEGGER, and H. SALOMON (*Helvetica Chim. Acta, 22 (1939), No. 6, pp. 1513–1516, fig. 1*).—This preliminary report presents the scheme of the reactions employed in the synthesis of compounds closely related to phylloquinone (vitamin K). The nor-α-phylloquinone, formed by a series of reactions starting with β-naphthyl-ethylmagnesiumbromide and 2,6,10-trimethyl-pentadecanone-14, differs from α-phylloquinone only by the lack of a methyl group in the 3-position. The nor-α-phylloquinone is described as *a viscous yellow oil crystallizing at lower temperatures; empirical formula* $C_{30}H_{44}O_2$; molecular weight 448 (determined), 438 (calculated); absorption maxima 242, 248, 261, 265, and 326 mμ (as compared with 243, 248, 261, 270, and 328 mμ for phylloquinone).

**Naphthoquinones of the vitamin $K_1$ type of structure,** L. F. FIESER, W. P. CAMPBELL, E. M. FRY, and M. D. GATES, JR. (*Jour. Amer. Chem. Soc., 61 (1939), No. 11, pp. 3216–3223*).—This paper discusses the methods of synthesis and presents the details of experimental work already noted (E. S. R., 83, p. 586).

**Synthesis of vitamin $K_1$,** L. F. FIESER (*Jour. Amer. Chem. Soc., 61 (1939), No. 12, pp. 3467–3475*).—This paper presents, with considerable detail in discussion and in presentation of the experimental work, a connected account of the synthesis of vitamin $K_1$ and the identification of the product with the natural vitamin. This work, much of which has been given briefly in a series of preliminary reports (E. S. R., 83, p. 586 and above), has led to the synthesis of 2-methyl-3-phytyl-1,4-naphthoquinone, essentially as a one-step process utilizing 2-methyl-1,4-naphthohydroquinone and phytol. A technic similar to that employed in the separation and purification of the synthetic product when applied to alfalfa concentrates was found useful in isolating the natural vitamin $K_1$. The identity of the synthetic product with the naturally occurring vitamin was established by a direct comparison of the samples with regard to analysis, spectrum, antihemorrhagic activity, color reaction, and the melting point and mixed melting point of a crystalline derivative.

A number of naphthoquinone derivatives similar to the vitamin were synthesized but found inactive, while 2-methyl-3-geranyl-1,4-naphthoquinone, also synthesized, showed moderate potency. Indications of a certain structural specificity are discussed, and it is suggested tentatively that the activity of the remotely related 2-methyl-1,4-naphthoquinone may be due to the ability of the organism (*chick*) *to utilize the compound as a component for synthesis* of the vitamin.

**A derivative of vitamin $K_1$,** H. J. ALMQUIST and A. A. KLOSE. (Univ. Calif.). (*Jour. Biol. Chem., 130 (1939), No. 2, pp. 791–793*).—The pigment (yellow in solution as the acid, reddish-brown in alkaline solution in the form of the ion) observed in earlier studies (E. S. R., 83, p. 14) on the alkaline hydrolysis of vitamin $K_1$ was prepared by hydrolysis of the vitamin in dilute sodium methylate, followed by extraction of the pigment in hexane, subsequent recovery from this solution, and final purification by molecular distillation. Molecular weight determinations on the product indicated values in the neighborhood *of 500, and the results of elementary analysis indicated the pro*visional formula $C_{31}H_{50}O_4$. In comparison the formula $C_{31}H_{46}O_2$ and the

molecular weight 450.4 for vitamin $K_1$ were indicated by earlier studies by the authors (E. S. R., 83, p. 585) and by Binkley et al. (E. S. R., 83, p. 586). Apparently, therefore, the alkaline hydrolysis caused no appreciable splitting of the vitamin, but produced instead an increase in molecular weight and a change in analysis, suggesting the addition of 2 oxygen atoms (at least 1 probably phenolic) and perhaps several hydrogen atoms. The stability of the side chain to alkaline hydrolysis suggested that this side structure was held to the 1,4-naphthoquinone nucleus by a carbon-to-carbon bond. Such would be the case with the phytyl group previously postulated for vitamin $K_1$ and introduced in the synthesis of active preparations of 2-methyl-3-phytyl-1,4-naphthoquinone.

**Vitamin K activity in the benzoquinone series**, S. ANSBACHER and E. FERNHOLZ (*Jour. Biol. Chem., 131 (1939), No. 1, pp. 399, 400*).—In assays of compounds of the benzoquinone series it was found that benzoquinone, toluquinone, trimethylquinone, and duroquinone had no potency at the 1-mg. level. However, phlorone, the 2,5-dimethylbenzoquinone, had vitamin K activity, exhibiting a potency of 1 unit (E. S. R., 83, p. 12) in about 1 mg. Unit for unit, however, the speed of action and period of efficacy, as measured by the blood-clotting time of individual chicks, was practically identical with that of the much more active compound 2-methyl-1,4-naphthoquinone, which showed unit activity at a level of $\frac{1}{2}\gamma$.

**Antihemorrhagic activity of 2-methyl-1,4-naphthoquinone**, H. J. ALMQUIST and A. A. KLOSE. (Univ. Calif.). (*Jour. Biol. Chem., 130 (1939), No. 2, pp. 787–789*).—In the assay of 2-methyl-1,4-naphthoquinone it was found that the apparent activity of the compound when dissolved in ethanol, cod-liver oil, Wesson oil, mineral oil, or methyl laurate, and incorporated in the diet, was far below the activity determined by daily oral administration of the test dose dissolved in ethyl laurate. Moreover, in the former method the apparent activities were much greater in the cases of cod-liver and Wesson oil and lowest in the case of ethanol.

The 2-methyl-1,4-naphthoquinone, two vitamin $K_1$ preparations, one furnished by Karrer, the other by Doisy, and a standard supplement were administered in oral doses (the test substances dissolved in 1 drop of ethyl laurate) according to the procedure of the dietary assay method of the authors (E. S. R., 82, p. 88). The two vitamin $K_1$ preparations were of equivalent high activity, such that on an average 1 gm. of the vitamin equaled 63,000 cc. of the reference standard solution. The activity of the 2-methyl-1,4-naphthoquinone was approximately 240,000. These results indicate that vitamin $K_1$ has less activity than its equivalent content of 2-methyl-1,4-naphthoquinone (38 percent), and that the presence of the phytyl side chain in the 3 position detracts from the activity of this quinone nucleus. It is suggested, therefore, that the synthesis of the more expensive and less active vitamin $K_1$ would have little practical value.

**The ultraviolet absorption of vitamins $K_1$, $K_2$, and some related compounds**, D. T. EWING, J. M. VANDENBELT, and O. KAMM. (Mich. State Col. et al.). (*Jour. Biol. Chem., 131 (1939), No. 1, pp. 345–356, figs. 11*).—This work, begun after isolation of vitamin $K_1$ from alfalfa and vitamin $K_2$ from putrefied fish meal, was undertaken to aid in the elucidation of the structure of the compounds. The compounds used were prepared by Doisy et al. in the course of their work (E. S. R., 83, p. 13). Absorption curves are presented for vitamins $K_1$ and $K_2$, for their reduction products, for the corresponding diacetates, and for the hydrolyzed diacetates of dihydro vitamin $K_1$. In addition, absorption curves are presented for certain 1,4-naphthoquinone derivatives, 1,4-benzoquinone, and 2,3-disubstitution products of 1,4-naphthoquinone. The maxima,

minima, and other characteristics of the curves for vitamins $K_1$ and $K_2$ were quite similar and were analogous to the naphthoquinone curves. Evaluation of the various curves led to the conclusion that vitamins $K_1$ and $K_2$ are derivatives of 2,3-dimethylnaphthoquinone and that the side chains contain no conjugated double bonds.

**The isolation of vitamin $K_2$,** R. W. McKee, S. B. Binkley, S. A. Thayer, D. W. MacCorquodale, and E. A. Doisy (*Jour. Biol. Chem., 131 (1939), No. 1, pp. 327–344, fig. 1*).—The isolation of vitamin $K_2$, referred to briefly in earlier reports (E. S. R., 83, p. 13), is considered in detail in the present paper. The method is discussed at length and illustrated by a typical experiment employing the isolation process. Commercial sardine meal served as the starting material. This was extracted with isopropyl ether as a preliminary step to remove natural lipides and then subjected to repeated (5 or 6) putrefactions of about 15 days' duration, followed each time by drying and extraction with petroleum ether, which served to remove the vitamin developed by bacterial action during the process of putrefaction. The solvent was removed by vacuum distillation, and the residue taken up again in sufficient petroleum ether to make a 3- to 5-percent solution of the solids. From this solution the vitamin was adsorbed on Decalso in a large adsorption column, petroleum ether being used to "develop" the column. After layering of the pigments the vitamin was eluted with 20 percent benzene in petroleum ether, the main portion being concentrated in the first three or four fractions. By several repetitions of the adsorption and elution, using medium and small permutite columns, a fairly pure preparation of the vitamin could be obtained. The product was further purified by crystallization from various solvents. Satisfactory crystals could be obtained by two crystallizations from a mixture of chloroform and methanol (1:1). The operations were carried out in diffuse light because of the instability of the vitamin to light.

The vitamin isolated in pure form as light yellow microcrystalline plates melted at 52°–53.5° C. and assayed 600 units per milligram. Calculations from elementary analysis indicated a possible formbla of $C_{40}H_{54}O_2$ (or $C_{38}H_{50}O_2$, $C_{39}H_{52}O_2$, $C_{41}H_{56}O_2$, or $C_{42}H_{58}O_2$). Catalytic hydrogenation caused the yellow compound to become colorless; the yellow color returned upon exposure to air, the resulting compound being capable of absorbing 2 atoms of hydrogen. The pure vitamin was converted by reductive acetylation to the diacetate of dihydro vitamin $K_2$, m. p. 59.5°–60.0° C., with a potency of one-half that of the vitamin. The halogen uptake of the diacetate of dihydro vitamin $K_2$ indicated the presence of six double bonds in the side chain. Ultraviolet absorption studies indicated that the diacetates of dihydro vitamin $K_1$ and vitamin $K_2$ were similar. These various findings are considered as evidence that the vitamin is a 2,3-disubstituted naphthoquinone with six double bonds in the side chains.

**Simultaneous production of wood pulp and the conversion of the noncellulosic constituents of wood into alcohols, oils, and resins,** E. E. Harris and E. C. Sherrard. (Coop. Univ. Wis.). (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1940, R1218, pp. [4]*).—Wood chips of various species were hydrogenated at 1,000 or at 3,000 lb. pressure in suspension and in an aqueous medium with the help of a nickel catalyst. Sufficient alkali (from 8 to 10 percent or more of the weight of the wood) to keep the solution alkaline at all times was necessary to prevent the acidic substances formed from inhibiting the activity of the catalyst. Pulp of good quality, requiring only a mild chlorine treatment, was produced, together with methanol, propanol, propyl cyclohexane derivatives, and an oily resin. Data from experiments with aspen, maple, slash pine, and red gum are tabulated.

## AGRICULTURAL METEOROLOGY

**Radio equipment for an un-manned weather station,** C. B. Pear, Jr. (*Bul. Amer. Met. Soc. 21 (1940), No. 3, pp. 107–110, figs. 3*).

**Experimental studies of anemometers,** S. P. Fergusson (*Bul. Amer. Met. Soc., 20 (1939), No. 7, pp. 307–309*).—An abstract.

**A motor-ventilated psychrometer for station use,** W. E. K. Middleton (*Bul. Amer. Met. Soc., 21 (1940), No. 2, pp. 63–65, figs. 2*).—The apparatus described and illustrated consists essentially of a centrifugal exhaust fan with special inlet duct, mounted on a standard split-phase induction motor of capacitor type.

**Relative humidity gradient and the form of cloud bases,** C. E. Deppermann (*Bul. Amer. Met. Soc., 21 (1940), No. 2, pp. 43–45*).—An abstract.

**Diurnal pressure differences in regions of high pressure,** G. W. C. Tait (*Bul. Amer. Met. Soc., 21 (1940), No. 2, pp. 39–43*).—"The differences between morning and evening pressures in a region of high pressure have been observed to be greater than normal differences. This was checked using Toronto station pressures. The effect is often explained as due to the expansion of warmed air, a direct result of increased insolation. Another explanation here suggested is based on changes in the surface divergence in a high, which are shown to be an indirect result of insolation. The latter explanation is shown to lead to pressure differences of appreciable magnitude."

**Ten years of large-scale studies of the weather** [trans. title], H. Philipps (*Naturwissenschaften, 27 (1939), No. 50, pp. 825–834, figs. 2*).—This is a review of 10 years' work in the preparing of 10-day forecasts at Homburg, involving the determination of mean pressure distributions and tracks and causes of variations in the depressions.

**Recent Australian papers on long-range forecasting,** C. F. Brooks (*Bul. Amer. Met. Soc., 21 (1940), No. 3, pp. 129, 130*).—A review.

**Problems of stream-flow forecasting on tributaries of the upper Mississippi,** B. S. Barnes. (U. S. D. A.). (*Bul. Amer. Met. Soc., 21 (1940), No. 3, pp. 95–100*).—"The satisfactory solution of most of our river forecasting problems in the Mississippi Valley will come only with more complete basic data, a unified and systematic service of reports and routine computations, and, most important of all, more study. Some of the problems appear impossible of solution, notably the prediction of the formation and breaking up of ice gorges, and whether the uppermost one of a series of gorges will break first or the lowest one."

**Hydrologic studies: Compilation of rainfall and run-off from the watersheds of the Red Plains Conservation Experiment Station, Guthrie, Oklahoma, 1931–38,** J. W. Slosser (*U. S. Dept. Agr., Soil Conserv. Serv., 1940, SCS–TP–32, pp. [168], figs. [71]*).

**Snow surveying,** J. C. Marr (*U. S. Dept. Agr., Misc. Pub. 380 (1940), pp. 46, figs. 7*).—For over 30 yr. forecasts have been made on the data obtained by measuring the water content of the snow accumulating during the winter, the accepted method of making these measurements being termed "snow surveying." This general treatise on the subject discusses the method and its reliability, when the surveys are taken and how the forecasts are made, the uses for water-supply forecasts, snow-sampling equipment and its care, snow-sampling and field office procedures, improvement and maintenance of snow courses and facilities for snow surveys, winter travel, and first aid. The success achieved in snow surveying is said to be due largely to the precautions always taken to insure that incoming cooperators appreciate the uses to which the data can be put and understand the

fundamental principles involved. This publication provides some of the needed information.

**Melting snow as a flood factor in the Sierra Nevada,** E. H. FLETCHER. (U. S. D. A.). (*Bul. Amer. Met. Soc., 21 (1940), No. 2, pp. 59–63*).—Based primarily on observation and experience of the past several years and applying mainly to the western slope of the central Sierra Nevada, it is concluded that the ultimate effect of snow on the flood situation depends on the rate of water drainage from the snow cover as well as on the melting rate, and the melting of snow depends primarily on the air temperature, though modified by rainfall. For snow covers of different depths the run-off per unit of time varies roughly with the density of the snow. Rainfall readily penetrates the snow cover, but the latter is capable of absorbing considerable water and thus of retarding the ground surface drainage. The surface freezing of the ground along and below the snow line effectively halts drainage from the saturated soil. The more rapid melting up to the 5,000-ft. level is a much greater flood hazard than is present at the higher elevations. The most destructive floods are possible in the absence of a consequential snow pack in the mountains. During a warm-front storm period the snow line may recede over a 1,000-ft. altitudinal belt, releasing a large volume of snow water over a limited area without being particularly menacing if it occurs only at low or intermediate altitudes and provided the storm is not unduly prolonged. However, if the belt of receding snow extends to comparatively high levels, the area of effective run-off is proportionately increased. The higher the snow line at the beginning of heavy, general rains, the greater the possibility of floods from rapid run-off. The ultimate effect of water from melting snow on the flood situation depends on the rapidity of melting, the soil conductivity, and the width and elevation of the zone over which the snow line recedes during the general storm. The magnitude and effectiveness of the run-off area are thus determined.

**The problem of world climate,** R. H. WHEELER (*Bul. Amer. Met. Soc., 21 (1940), No. 2, pp. 46–58, figs. 2*).—"This paper in part abstracts a lengthy and detailed investigation of climate and human behavior now in progress." While the viewpoint relates largely to the implications for psychology and social science, considerable climatological data are given, including tabulations of temperature and rainfall correlations among various regions and a schematized summary of world climate since 1800. It is concluded that probably since 1800, certainly since 1860, the status of climate the world over, where information is available, justifies the concept of "world climate." Temperatures and rainfall, the former more definitely, tend to rise and fall together over the world as a whole. World climate tends to fluctuate in accordance with a definite pattern, presented in detail.

**Studies in solar radiation and their relationship to biophysics and the general problem of climate and health,** G. W. KENRICK and G. DEL TORO, JR. (*Puerto Rico Jour. Pub. Health and Trop. Med., 15 (1940), No. 4, pp. 387–431, figs. 22; Span. abs., pp. 420–431*).—The paper describes work directed toward the contribution of quantitative physical data useful in biological problems, particularly those related to climate and health, and their applications to some of the problems to which it is believed such a program should contribute. The text considers the historical development of the program at the School of Tropical Medicine, the results obtained from solar radiation measurements, applications of solar radiation data, intercomparison of ultraviolet measuring equipment, and the scope and applications of a measurement program. There are 18 references.

**The use of solar energy for the melting of ice,** H. LANDSBERG. (Pa. State Col.). (*Bul. Amer. Met. Soc., 21 (1940), No. 3, pp. 102–107, fig. 1*).—That the self-perpetuation of an area covered by ice or snow is largely determined by the

radiation properties of the surface was indicated by experiments with blocks of ice covered with coal dust as compared with uncovered controls. It was clear that if the albedo of a snow or ice cover is changed toward a greater absorption of incident energy, considerable amounts may be gained. It is believed that the direct use of solar energy by changing albedos of larger or smaller parts of the earth's surface has been neglected, and that some success in influencing climate on a small scale can at least be hoped for.

**Micro-climate and the agricultural engineer,** C. Lorenzen, Jr. (*Bul. Amer. Met. Soc., 21 (1940), No. 3, pp. 114, 115*).—An abstract.

**Physico-chemical studies on the nature of cold resistance in crop plants.** (Partly coop. U. S. D. A.). (*Nebraska Sta. Rpt. [1939], pp. 29, 30*).—A progress report on work with various types of plants.

**Papers on fruit-frost studies in Florida by the U. S. Weather Bureau** (*Bul. Amer. Met. Soc., 21 (1940), No. 2, pp. 65–70*).—Temperature Survey Work in Florida, by M. L. Blanc (pp. 65, 66); Critical Temperatures of Florida Citrus Fruits, by A. L. Griggs (p. 66); Instrumental Equipment and Grower Education in Florida, by L. G. Pardue, Jr. (pp. 66, 67); Study of Surface Temperature Inversions at Seville, Florida, by C. G. Reeves (pp. 67, 68); Frost Protection by Sprinkler Irrigation, by R. T. Sherouse (p. 68); A Study of the Influence of the Lake Okeechobee Levee on Temperatures Over the Surrounding Mucklands, by P. J. Powell (pp. 68, 69); Radiational Factors Affecting Temperatures in Lake Okeechobee Mucklands, by J. W. Milligan (pp. 69, 70); and A Comparison of Cold Night Temperatures Over Muck and Sand Soils, by M. L. Blanc (p. 70).

**State crops severely injured by weeks of unseasonable rainfall—cotton suffers most; fertile bottoms of wide area flooded,** C. Dorman (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 7, pp. 1, 8*).

**A bibliography of tree-ring analysis,** E. Schulman (*Tree-Ring Bul., 6 (1940), No. 4, pp. 27–39*).—This bibliography (412 titles) is largely limited to papers dealing in whole or part with the analysis of tree rings in relation to climatic and archaeologic studies.

**Estimated ring chronology, 150–1934 A. D.,** A. E. Douglass (*Tree-Ring Bul., 6 (1940), No. 4, insert, pp. [7], figs. 12*).—Charts are given showing the estimated tree-ring chronology of the western Pueblo area of the United States.

**Climatological survey for Ohio and Wooster, 1938 and 1939,** J. T. McClure (*Ohio Sta. Bimo. Bul. 204 (1940), pp. 109–111*).—A brief discussion of weather for 1938 and 1939 and a tabulated climatological summary for Wooster and for the State covering these 2 yr.

## SOILS—FERTILIZERS

**[Soil investigations by the Massachusetts Station]** (*Massachusetts Sta. Bul. 369 (1940), pp. 8–10, 11–14, 52, fig. 1*).—The report notes studies on the use of nitrogen as an aid in decomposing old sod, by K. J. Kucinski and W. S. Eisenmenger; the relative rate of nitrification of nitrogen materials on certain tobacco soils, by Eisenmenger and J. Richard; the absorption by food plants of chemical elements important in human nutrition, and the intake by plants of elements applied to the soil in pairs compared to the intake of the same elements applied single, both by Eisenmenger and Kucinski; the relative intake of certain elements by calciphile plants and calciphobe plants grown on soils at varying pH, by Eisenmenger and W. H. Bender; magnesium requirements of plants, by Eisenmenger and Kucinski; the effect of arsenious oxide ($As_2O_3$), arsenic oxide ($As_2O_5$), and antimony oxide ($Sb_2O_3$) on soil and plant growth, by H. M. Yegian and Eisenmenger; relationship of natural vegetation to physico-

chemical properties of soils of Massachusetts, by Eisenmenger and W. S. Colvin; a survey of erosion problems arising from changes in land use, an investigation of the source and nature of erosional damage on the alluvial soils of Massachusetts, a study of the physical and chemical properties of wind-blown soils, and the relation between the rate of wind erosion and the principal factors affecting it, all by Kucinski and Eisenmenger; and Podzols of Massachusetts, by A. B. Beaumont.

**[Soil investigations by the Nebraska Station]** (*Nebraska Sta. Rpt. [1939], pp. 5–9*).—This report notes work on soil-erosion control and soil-moisture conservation (coop. U. S. D. A.), use of commercial fertilizers for cereals, revegetation of abandoned land, studies on the solubility of soil phosphorus, factors affecting permeability of soils to water, and determination and composition of soil organic matter.

**A survey and discussion of lysimeters and a bibliography on their construction and performance,** H. Kohnke, F. R. Dreibelbis, and J. M. Davidson (*U. S. Dept. Agr., Misc. Pub. 372 (1940), pp. 68, fig. 1*).—Lysimeter types are classified; the history of their installation and use for soil investigations and for water movement studies is outlined from the experiments of P. de la Hire in France, set up in 1688, to the equipment of the present time; established lysimeter findings are summarized; and suggestions for the construction, experimental plan, etc., of future lysimeters are offered. It is concluded that, despite the limitations pointed out, "many questions concerning pedology, soil fertility, and hydrology can be answered by the correct use of lysimeters. Filled-in lysimeters may fulfill useful tasks in fertility investigations if a sound water balance is maintained in the soil, but for pedologic and hydrologic studies carefully designed monolith lysimeters seem to be indispensable."

The bibliography of 489 titles, geographically classified, indicates by a letter code the type of information to be found in each publication listed.

**Some principles of accelerated stream and valley sedimentation,** S. C. Happ, G. Rittenhouse, and G. C. Dobson (*U. S. Dept. Agr., Tech. Bul. 695 (1940), pp. 134, pls. 16, figs. 19*).—This bulletin presents results of a study of the principles of stream and valley sedimentation under the influence of culturally accelerated soil erosion, a step in a research project of which the ultimate objective is a sound and scientific program to prevent or alleviate damage to valley resources by such sedimentation. The present report is based chiefly on detailed studies of sedimentation in the drainage basins of Tobitubby and Hurricane Creeks, in Lafayette County, Miss., representative of one of the areas of most severe soil erosion and associated sediment damage in the Gulf Coastal Plain. The first of the two main parts of the bulletin is devoted to a description of conditions in these valleys and their tributary drainage areas. In the second part, 45 principles developed by analysis of the results of this investigation and less detailed studies in other parts of the United States are outlined and discussed.

"Accelerated stream and valley sedimentation is much more widespread and progressive accumulation is taking place much more rapidly than has been commonly realized either by the general public or by specialists in allied fields of scientific inquiry. The past and prospective future damage resulting from such sedimentation is of sufficient importance to be of national concern. Damage has been of many diverse kinds, but so far as is now known the most important have been (1) impairment of the productive capacity of agricultural valley lands by changes in soil texture, composition, or drainage, (2) aggravation of flood danger and flood damage by filling of channels and aggradation of flood plains with consequent increases in height and frequency of overbank floods, and (3) impairment of the effectiveness or usefulness of artificial structures and improvements. The amount of damage varies greatly according to the area and value of

the land and the size and value of structures or improvements within the areas of excessive sediment accumulation, as well as according to the rates of sedimentation.

"Texture of sediment is a major factor in determining the nature of sedimentation and the extent of the damage. Largely on this account gullying, valley trenching, and stream-bank erosion are judged to be relatively more important, in comparison with sheet erosion, as sources of harmful sediment than as causes of erosional damage alone. It also appears that the erosional areas responsible for the most serious sediment damage may not be the areas that have been most seriously damaged by erosion."

**The determination of run-off and erosion from New Hampshire upland soils.** (Coop. U. S. D. A.). (*New Hampshire Sta. Bul. 319 (1940), pp. 22, 23*).—This contains brief notes on the comparative benefits of different species of riverbank vegetation in checking stream-bank cutting and an analysis of erosion in relation to potato soil types.

**Relation of surface soil acidity to activity of Azotobacter in Fargo clay soils,** T. O. Berge (*North Dakota Sta. Bimo. Bul., 2 (1940), No. 6, pp. 16–18*).—*Azotobacter* appeared to be fairly abundant in alkaline soils in and near Fargo, particularly where lime content is high. However, in 37 long-term plats, where soil reaction varied between pH 4.90 and 6.80, typical *Azotobacter* were found to be markedly deficient both in number and in activity. Even in certain rotation plats where lime and phosphates are added at 4-yr. intervals and a reaction as high as pH 6.4 to 6.8 (second year after addition of lime) was found, the *Azotobacter* showed relatively poor development.

Preliminary investigations at this station have indicated that anaerobic Clostridia may play a larger role in the nonsymbiotic fixation of nitrogen in the soils examined than do organisms of the *Azotobacter* type.

**Soil testing: Operation, interpretation, and application,** F. G. Merkle (*Pennsylvania Sta. Bul. 398 (1940), pp. [2]+34, figs. 7*).—It is the purpose of this bulletin to review the present status of soil testing, to show what the tests are adapted for and how to interpret them, and to point out their limitations as well as present knowledge permits. The conclusions reached are supported by determinations in some 6,000 soil samples obtained from soils in various uses over a period of 8 yr. They are based largely upon soil conditions in Pennsylvania.

The procedures used at the station and described in this bulletin are partly adaptations of the methods of others and partly direct applications of microchemical methods. As an extracting solution, 0.25 N sodium acetate is prepared by dissolving 10 gm. of pure stick sodium hydroxide in water and diluting the solution to about 600 cc., to which is added 19 cc. of glacial acetic acid, and the solution is made up to a volume of 1 l. When this solution is cool, the pH value is determined and finally adjusted to 5 by adding acid or alkali as needed. Exact normality is not important, but the pH must be correctly adjusted. For the extraction, 10 gm. of air-dry soil, which has been sieved through a 2-mm. sieve, is placed in a lipped tumbler and 50 cc. of the extracting solution added. When only approximate results are wanted the soil may be measured in a brass cup having a volume of 9 cc. The soil and solution are mixed with a glass rod, with care to break all granules, and allowed to settle for 10 min. from the time of adding the solvent. The mixture is then filtered through a phosphate-free filter paper. The filtrate is usually clear, but occasionally it is necessary to pour it through a second time. This extract is used for all determinations.

**Recent work concerning rapid soil tests in relation to crop yields in the United States,** M. S. Anderson. (U. S. D. A.). (*Chron. Bot., 5 (1939), No. 4–6, pp. 379–381*).—A brief review and evaluation of the methods in use.

**Types of vegetation in Escalante Valley, Utah, as indicators of soil conditions,** H. L. SHANTZ and R. L. PIEMEISEL (*U. S. Dept. Agr., Tech. Bul. 713 (1940), pp. 46, pls. 16, figs. 7, map 1*).—From an extensive study of soil-plant relationships, the authors found that most reliable indicators of soil conditions are the stable plant communities that have occupied the soil over a long period of time and have nearly reached equilibrium with soil and climate. The mixed growth of a variety of species that ordinarily are not associated with one another indicates disturbed soil conditions that may include a wide range of soil types from low dunes of sand to hummocks of heavy soil. The temporary communities of annuals, such as Russian-thistle, indicated damaged or destroyed original plant covers with or without a pronounced disturbance of the soil.

"In Escalante Valley, lands covered with a large bushy growth of sagebrush or sagebrush-greasewood indicate two of the best types for crop production under irrigation. Little rabbitbrush, galleta, winterfat, and shadscale land can become productive under irrigation. The first-mentioned may need special handling because of its light texture. Lands with a very poor growth of sagebrush or shadscale are less desirable because of a gravelly or a saline subsoil. With these leaching and draining may be necessary, as well as irrigation, as is the case with greasewood or greasewood-shadscale lands. Saltgrass already subirrigated is valuable for grazing. Both saltgrass and pickleweed lands are wet and saline and need draining and leaching before crops can be produced. The expense would usually be prohibitive. In this valley most of the juniper land is too stony and rough for crop production. Most of the irrigated land lying near the mountains was formerly covered with sagebrush."

**The relation of nitrogen, phosphoric acid, and lime in the soils of east Texas to those constituents in Bermuda and little bluestem grasses,** J. F. FUDGE and G. S. FRAPS. (Tex. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 3 (1938), pp. 189–194*).—Significant correlation coefficients with respect to nitrogen were secured in Bermuda grass when the nitrogen content of the soil was less than 0.11 percent and in bluestem with all soils, with respect to phosphoric acid in Bermuda grass and young bluestem only when soils high in active phosphoric acid were included, and with respect to lime in Bermuda grass and mature bluestem when soils high in active lime were included and in young bluestem at all levels of active lime in the soil. Within a given forage group, significant positive correlations between protein and phosphoric acid were found in all groups, and also between protein and lime in young bluestem. A significant negative correlation between phosphoric acid and lime was found in mature bluestem. By partial correlation, additional significant correlations were found between protein and lime in Bermuda grass and between phosphoric acid and lime (negative) in Bermuda grass on soils of low fertility. Both young and mature bluestem grasses were deficient in phosphoric acid, and mature bluestem was deficient in protein.

**Retention by soils of the nitrogen of various compounds as shown by subsequent plant response,** J. P. CONRAD. (Calif. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 9, pp. 617–630, figs. 3*).—The technic of Conrad and Adams (E. S. R., 81, p. 171), consisting in the percolation of a solution of the nutrient to be tested through a column of successive pots of soil, followed by cropping of the pots to show the relative quantities of the nutrient retained in each, was used to indicate the relative retention of nitrogen in anionic, in cationic, and in nonionizing combinations.

Calcium nitrate, sodium nitrate, sodium nitrite, potassium cyanide, and potassium cyanate were not retained by the solids in the soils tested, as was shown by beneficial plant response in all pots of the respective columns. Nonretention

of sulfamic acid, picric acid, and sodium thiocyanate was shown by injury to the growth throughout the pots of the respective columns.

Ammonium acetate, ammonium carbonate, ammonium hydroxide, ammonium phosphate (monohydrogen), ammonium sulfamate, ammonium sulfate, hydrazine sulfate, hydroxylamine sulfate, tetramethylammonium chloride, and the hydrochlorides of trimethylamine, dimethylamine, methylamine, choline, and arginine were completely or almost completely retained in the top pots of their respective columns. Most of the nitrogen of semicarbazide hydrochloride and of guanidine carbonate was retained in the top pots of their respective columns. Small but significant quantities penetrated to lower pots.

There was no evidence of any retention of the nitrogen of acetonitrile, acetoxime, or acetamide. The nitrogen of glycine, cysteine hydrochloride, glutamic acid, formamide, urea, and $CaCN_2$ was retained to a certain degree. "Indications are that decomposition to liberate ammonia and the resultant retention of this form of nitrogen during the period of actual percolation are important factors in retention with these compounds." Peptone, egg albumin, and blood albumin showed the same type of retention, whereas the nitrogen of gelatin and that of theobromine were completely retained in the top pots of their respective columns.

**Bibliography of literature on potash as a plant nutrient, reviewed July 1939 to September 1939,** D. H. Jameson and C. M. Schmidt (*Washington, D. C.: Amer. Potash Inst., Inc., 1940, pp. [3]+80+XVII*).—A copiously annotated bibliography.

**The cause and nature of overliming injury,** A. R. Midgley and D. E. Dunklee (*Vermont Sta. Bul. 460 (1940), pp. 22, pls. 4, fig. 1*).—Overliming injuries may occur if applications of lime are not thoroughly mixed with certain soils, plants developing distinctive pathological symptoms or being killed. Injury occurs particularly on acid upland podzolized soils, on some sandy soils, and on acid peat bogs. It may occur on any field soil if limed to excess after leaching with a dilute mineral acid and then with distilled water.

Certain soils when overlimed were shown to fix much boron in a form unavailable to crop growth. This appeared to be the cause of the overliming injury. The application of increasing rates of lime caused increasing fixation. Neither lime itself nor the soil itself fixed appreciable quantities, but when mixed together they were active irrespective of the form of boron or lime used. Bark, leaves, decayed wood, crop, and lignin residues fixed boron when overlimed. These appeared to be the main sources of organic boron-fixing material in soils. Certain synthetic organic boron-fixing substances similarly activated by excess lime were prepared and tested. Fixation seemed to be chemical rather than biological in its nature.

Applications of superphosphate, manure, calcium, or aluminum silicates correct the trouble, although pure soluble phosphates do not. Boron alone, of the many single elements tried, was effective. The corrective action of other materials seemed to be due to their boron content. Borax applications benefited certain crop plants which suffer injury from excess lime, but did not appreciably benefit timothy, oats, corn, or other grasses. Borax may be broadcasted or used as a spray. Rates of from 10 to 40 lb. per acre broadcast were found satisfactory for alfalfa. It is emphasized that great care must be exercised, since even a small excess may prove harmful. The need in Vermont seems confined to certain local areas where soils once acid have been generously limed, and to apple orchards showing internal cork and other symptoms of boron deficiency. Soils on which manure or wood ashes have been liberally used are not apt to need special applications.

**Second annual report of the Arizona fertilizer control office, year ending December 31, 1939,** W. T. McGeorge, E. O. Foster, and R. D. Taylor (*Ari-

*zona Sta. Bul. 169 (1940), pp. [1]+127-133).*—In connection with the annual tabulation (E. S. R., 82, p. 23) of registrations and fertilizer analyses, 1939, this bulletin calls attention to the special type of fertilizer need shown in general by semiarid soils. Arizona soils are stated to have a considerable supply of insoluble phosphate but to be very deficient in available phosphate. They are also deficient in nitrogen but are well supplied with available potassium, and "few fertilizers sold in the State contain any potash."

**Registration, labeling, and inspection of commercial fertilizers, 1939,** M. F. Miller, L. D. Haigh, E. W. Cowan, and L. L. Wiseman (*Missouri Sta. Bul. 417 (1940), pp. 51*).—The usual tabulation, for 1939, of the analytical data and information concerning the requirements and operation of the State fertilizer law are here given.

## AGRICULTURAL BOTANY

**[Botanical reviews]** (In *Annual Review of Biochemistry, IX*, edited by J. M. Luck and J. H. C. Smith. *Stanford University, Calif.: Ann. Rev., Inc., 1940, vol. 9, pp. 459-508, 529-592*).—The following critical reviews of recent research are of special interest to botany: Plant Pigments, by G. Mackinney (pp. 459-490), and Aspects of Inorganic Metabolism in Plants, by C. B. Lipman (pp. 491-508) (both Univ. Calif); Organic Acids of Plants, by H. B. Vickery and G. W. Pucher (pp. 529-544) (Conn. [New Haven] Expt. Sta.); The Biochemistry of Viruses, by W. M. Stanley (pp. 545-570); and Biochemistry of the Lower Fungi, by H. Raistrick (pp. 571-592).

**[Botanical papers]** (*Iowa Acad. Sci. Proc., 46 (1939), pp. 97-117, 127, 129-140, 161-165, 167-179, 180, 181, figs. 26*).—The following papers are included: Iowa Species of *Agropyron*, by D. W. Augustine (pp. 97-104), and Plants New to Iowa, by G. J. Goodman (pp. 105, 106) (both Iowa State Col.); The Relation Between Chlorophyll Concentration and the Internal Surface of Mesomorphic and Xeromorphic Leaves Grown Under Artificial Light, by F. M. Turrell (pp. 107-117) (Calif. Citrus Expt. Sta.); and Teaching Aids in Botany—I, The Placement Test, by S. M. Dietz and C. J. Gould, Jr. (p. 127), and II, Diagrams, by S. M. Dietz (pp. 129-140), The Genus *Arabis* in Iowa, by C. D. Paris (pp. 161-165), A Preliminary List of Plants of the Sand Mounds of Muscatine and Louisa Counties, Iowa, by M. E. and R. G. Brown (pp. 167-178), A Quantitative Study of the Early Weed Stage of Secondary Plant Succession in Central Iowa, by J. M. Aikman and H. F. Barr (p. 179), Histology of a Genetic Malformation in Corn, by J. E. Sass and A. A. Bryan (p. 180), and Cytoplasmic Structures in the Basidium Revealed by Silver Impregnation, by J. E. Sass (p. 181) (all Iowa State Col.).

**[Abstracts of theses]** (*La. State Univ. Bul., n. ser., 32 (1940), No. 1, pp. 29, 30, 33, 98, 99*).—The following are of interest to botany: Studies on the Toxicity of Cerium Compounds for Bacteria, by S. C. Burkes (pp. 29, 30); Studies on Bacterial Antagonism, by C. L. Mixon (p. 33); and Vegetation of the Southwestern Part of Puerto Rico, by I. Velez (pp. 98, 99).

**[Botanical studies by the Massachusetts Station]** (*Massachusetts Sta. Bul. 369 (1940), pp. 21, 22*).—Studies of the effects of soil temperature on gardenias, by L. H. Jones, and soybean root temperature effects in a nutrient solution, by Jones and G. E. O'Brien, are reported upon briefly.

**[Abstracts of papers on plant physiology]** (*Assoc. South. Agr. Workers Proc., 41 (1940), pp. 159, 188, 207, 208*).—The following papers are of interest to agricultural botany: The Effect of Foliar Conditions on the Photosynthetic Activity of Pecan Leaves, by H. Lutz and M. B. Hardy (p. 159), and Use of Hormone Treated Cuttings and Special Type Grafts in Cotton Breeding, by W. H. Jenkins, D. C. Harrell, and J. O. Ware (p. 188) (both U. S. D. A.); Carotene and Vitamin

C in Forage Crops, by A. O. Leonard (p. 207) (Miss. State Col.); Abstract of Effect of Nutrient Deficiencies of Young Pine Seedlings, by L. J. Pessin (pp. 207, 208) (U. S. D. A.); and Properties of Nielson's So-Called Substance-B, by C. L. Worley (p. 208).

**Experimental designs to increase accuracy of greenhouse studies,** W. J. Youden (*Contrib. Boyce Thompson Inst., 11 (1940), No. 3, pp. 219–228*).—It has been shown that even in the comparatively well-controlled cultural conditions available in greenhouses the proper disposition of the test pots contributes markedly to the accuracy of the results obtained. In the first example it was found that 84 percent of the total sum of squares was accounted for by differences between complete replications along the bench and differences between the incomplete blocks across the bench. Expressed another way, the standard deviation of a single pot was reduced from 7.2 to 3.1 gm. These amounts are 21.5 and 9.4 percent, respectively, of 33.5 gm., which is the average yield of a single pot. The examples given exemplify the effectiveness of experimental design when account is taken of the characteristics of the material or environment encountered. It is apparent that much depends upon an apt selection of an arrangement which will take the fullest possible advantage of either known or suspected similarities in the material or environment. Experimenters are usually aware of the existence of such groupings of their material but have, until recent years, been unable to make much use of these groups. This paper makes available a number of new arrangements of Latin squares with missing rows which should be found useful in greenhouse studies.

**A speedier and less costly method of concentration in nitrocellulose imbedding,** H. W. Jensen (*Science, 91 (1940), No. 2369, pp. 509, 510, fig. 1*).—This is a modification of the Jeffrey-Wetmore technic[6] by means of which used celloidin may be employed again and the time factor may be reduced.

**An inexpensive microphotographic camera,** E. M. Abrahamson (*Science, 91 (1940), No. 2369, p. 510, fig. 1*).—An adaptation of the inexpensive Univex camera, model AF, to photomicrographic work.

**Morphology of the vegetative organs of sugarcane,** E. Artschwager. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 8, pp. 503–549, pls. 10, figs. 14*).—In continuation of previous studies (E. S. R., 53, p. 324; 64, p. 618), the author attempts to evaluate certain vegetative characters from the standpoint of their usefulness in taxonomic description of sugarcane varieties. Stability of vegetative characters is only relative, since a character which appears fixed in one variety may show great fluctuation in another. Abnormal environal conditions may intensify normal variability or they may have little or no effect, depending on whether a given character is conservative or a more recent adaptation. There are 32 references.

**Floral initiation in Biloxi soybeans as influenced by age and position of leaf receiving photoperiodic treatment,** H. A. Borthwick and M. W. Parker. (U. S. D. A.). (*Bot. Gaz., 101 (1940), No. 4, pp. 806–817*).—"Individual leaves on a Biloxi soybean when subjected to photoperiodic stimulation differ in their capacities to cause floral initiation. The most effective leaf on the plant is the one that has most recently attained its full size. Young leaves increase in their capacity to effect floral initiation until they attain full size, after which they gradually decline in effectiveness. The most active leaf, operating alone, is able to cause initiation of as many flower buds per plant as are formed when all leaves function simultaneously. The capacities of different leaves to supply a flower-forming stimulus are correlated with their relative states of maturity

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[6] R. H. Wetmore. Stain Technol., 7 (1932), No. 2, pp. 37–62, figs. 6.

and not with their distances from the growing points where flowers are formed. When the flower-forming stimulus from the third compound leaf passes downward through two internodes to the bud in the axil of the first compound leaf, it induces the formation of more flower primordia there than does the stimulus from the first compound leaf which is situated immediately adjacent to the bud. The flower-forming stimulus produced by the leaves of soybeans moves readily both up and down the stem."

**Absorption of soil moisture by maize roots,** C. H. Davis. (Univ. Ariz.). (*Bot. Gaz., 101 (1940), No. 4, pp. 791–805, figs. 3*).—Observations of roots of corn plants in a glass-front box gave reasonably good estimates of the numbers in a narrow greenhouse box. Roots of established plants absorbed water from the soil more rapidly near the plant than at 3–4 ft. Roots of growing plants extracted water below the wilting percentage in soil near the plant when similar numbers of roots were present in moisture above the wilting percentage 4 ft. away. Water 4 ft. from the plant was eventually absorbed after the soil near the plant had dried below the wilting percentage. Growth of young plants under the test conditions was slowed by decreasing soil moisture and was stopped when the soil moisture percentage was still above the wilting percentage and the calculated wilting coefficient. Water absorption by roots is apparently a dynamic activity depending on the amount of water in the soil and the distance between the water and the transpiring plant tops.

**The factors determining the resistance to the movement of water in the leaf,** C. L. Mer (*Ann. Bot. [London], n. ser., 4 (1940), No. 14, pp. 397–401, figs. 8*).—The effect of severing the midrib and parts of the lamina on the absorption and transpiration of leaves (*Pelargonium zonale* variety used) is described. It is concluded that the resistance to water movement through the net veins is very small compared with the resistance to its passage out of the veins into the mesophyll cells.

**Observations on the anaerobic respiration of potato tubers,** J. G. Boswell and G. C. Whiting (*Ann. Bot. [London], n. ser., 4 (1940), No. 14, pp. 257–268, figs. 4*).—As far as potato tubers are concerned, the results reported suggest that neither the forms of the $CO_2$ output curve during the hours immediately after transference from air to nitrogen nor the ratio of anaerobic to aerobic $CO_2$ output is evidence of the existence of oxidative anabolism during aerobic respiration. The form of the $CO_2$ output curve for whole tubers under anaerobiosis is considered the resultant of the output of the gas from the cells and that liberated from chemical combination with the tissue due to a decrease in tissue basicity under anaerobic conditions. On this interpretation the rate of $CO_2$ output from the cells is always lower under anaerobic than under aerobic conditions.

**An experimental study of the permeability to gases of the seed-coat membranes of Cucurbita pepo,** R. Brown (*Ann. Bot. [London], n. ser., 4 (1940), No. 14, pp. 379–395, fig. 1*).—"An apparatus is described by which the absolute rates of diffusion of gases across the seed coat can be measured. The seed coat of *Cucurbita* consists of two membranes, of which the outer is much less permeable to gases than is the inner. It is the inner, however, that controls the gaseous exchange since the outer is perforated by the micropyle. The mean values for diffusion in cc./cm.$^2$/hr. are as follows: Outer membrane, $CO_2$ 3.0, $O_2$ 0.35, $N_2$ 0.31; inner membrane, $CO_2$ 15.5, $O_2$ 4.3, $N_2$ 3.2. The absorption of water increases the permeability to gases of the inner membrane by (1) providing a medium in which the gases can dissolve, (2) removing in solution some impermeable constituent. The saturated membrane is less permeable than one which has been partially dried, since in the first the lumina and intercellular spaces are occupied by water, whereas in the second free paths for diffusion

exist. There is in the inner membrane a living layer in which the resistance to diffusion is high. When this layer is killed the rate of diffusion across the whole membrane increases considerably. The structure of the seed coat is described, and its bearing on the problem under consideration is discussed."

**The salt relations of plant tissues.—I, The absorption of potassium salts by storage tissue,** W. STILES and A. D. SKELDING (*Ann. Bot. [London], n. ser., 4 (1940), No. 14, pp. 329–363, figs. 11*).—Absorption by carrot root tissue of both ions of a number of K salts (chloride, bromide, nitrate, dihydrogen phosphate, and sulfate) was followed for 4–5 days by determining the fall in concentration of the external solution, use being made of adsorption indicators, the polarograph, and the Spekker absorptiometer. From all the salts except sulfate, absorption of both ions proceeded rapidly. The rate of intake of $K_2SO_4$ ions, although notably less than for other salts examined, was nevertheless quite definite in younger carrots. At the end of the storage season, however, it may be negligible. Apart from any initial exosmosis the absorption of all ions examined followed a two-phase course. The first phase was characterized by more rapid initial absorption, which fell off with time. The second phase, becoming evident after 2–3 days, was characterized by an increased absorption rate, and the falling off of this rate was conditioned by exhaustion of the external solution in respect to the ion concerned. The two-phase course of absorption can be explained as due either to an increase in permeability of cell membranes as a result of exposure to a solution of the salt employed, or to absorption being of two kinds. It is held that present evidence is inadequate to decide which view is correct. The two ions of a salt are absorbed unequally, but as such unequal absorption involves exosmosis of ions from the tissue, the degree of unequal absorption depends on the extent to which exosmosis of ions is possible. Hence, the departure from equality in absorption rate of cations and anions is more marked with dilute than with stronger solutions, since the concentration of ions available for exosmosis will be relatively less in relation to the amounts of ions absorbed the higher the concentration of the external solution. There are 31 references.

**Bibliography of references to the literature on the minor elements and their relation to plant and animal nutrition,** compiled by L. G. WILLIS (*New York: Chilean Nitrate Ed. Bur., Inc., 1940, 3. ed., Sup. 1, pp. 82*).—A supplement to the third edition (E. S. R., 81, p. 186).

**Botanical index to the third edition of bibliography of references to the literature on the minor elements and their relation to plant and animal nutrition** (*[New York]: Chilean Nitrate Ed. Bur., Inc., 1940, pp. 24*).—See above.

**Distribution of selenium in Astragalus bisulcatus and seleniferous soils,** L. R. WILLIAMS (*Thesis, Univ. Ill., Urbana, 1939, pp. [2]+4*).—An abstract of a thesis.

**The effect of low concentrations of selenium upon the growth of grain,** G. W. STANFORD and O. E. OLSON. (S. Dak. State Col.). (*S. Dak. Acad. Sci. Proc., 19 (1939), pp. 25–31*).—Examination of relative growth values and comparative dry weights of tops and roots of wheat seedlings indicated a possible stimulation to growth from additions of selenium in the form of $Na_2SeO_3$, low concentrations of Se (0.01–0.05 p. p. m.) appearing to cause root elongation. Increases in the length of leaves in corn without added Se were more rapid than in those receiving it, but the average dry weights of roots indicated that root development was stimulated by adding low concentrations (below 0.05 p. p. m.). Dry weights of tops indicated no inhibition or stimulation of growth in corn by Se. The average dry weights of oat roots and tops failed to show growth effects from Se, but growth values indicated an increase in the rate of change in height of plants from low concentrations. Sorghum growth was apparently stimulated somewhat by adding small amounts of Se to culture solutions.

**Some effects of treatment of non-dormant seeds with certain growth substances,** L. V. Barton (*Contrib. Boyce Thompson Inst., 11 (1940), No. 3, pp. 181–205, figs. 4*).—Seeds of various plants were treated with growth substances in the form of vapors, liquids, or dusts, and their effects on germination and further growth noted. Soaking in solutions of potassium α-naphthaleneacetate at 320, 106.6, 35.5, 11.8, 3.7, and 1.2 mg./l. failed to increase the rate or percentage of germination, and injury resulted from the higher concentrations. Powder treatments with Auxan, Rootone, or Merck preparations (containing indolebutyric acid at 2, 5, 8, or 12 mg./gm.) also failed to stimulate, and similar treatments of 6-year-old tomato seeds revealed no advantages in germination. Measurements of very young seedlings from treated seeds of nine different varieties indicated increased seedling length following certain treatments of eggplant, radish, and stock, these differences being apparent only when the seeds were germinated on moist filter paper. Stunting effects followed treatment of all nine types of seeds with one or more of the higher concentrations. In tomatoes grown to maturity from treated seeds, no stimulation was noted, but some stunting effects persisted. Treated and control seed lots of meadow fescue, perennial ryegrass, Kentucky bluegrass, oats, spring rye, and wheat produced plants having the same growth rates and times of maturity. Studies of the flowering in larkspur, marigold, nasturtium, snapdragon, stock, and zinnia plants from treated seeds revealed no significant differences from controls, either in number of plants producing flowers or in number of flowers appearing. In many radish taproots from seeds treated with the higher concentrations, a constricted region was produced after the root started to enlarge, and below this constriction a second enlargement developed, giving the appearance of a double root. There are 23 references.

**Seed treatments with talc and root-inducing substances,** W. J. Youden (*Contrib. Boyce Thompson Inst., 11 (1940), No. 3, pp. 207–218, figs. 2*).—Seeds of wheat and soybeans were treated in the dry state with indoleacetic, indolebutyric, and naphthaleneacetic acids, talc, and Rootone and grown in sand and soil in the greenhouse and field. The concentration of the organic compounds in the talc preparations, as well as the proportion of powder to seeds, was adjusted to cover the range 0.5–240 p. p. m. of active substance by weight of seeds. In 10 experiments, observations of the germination, seedling height, wet weight of tops, grain yield, and root systems yielded no significant case in which the germination and growth of the treated seeds exceeded the controls. On the contrary, the evidence in the aggregate pointed to slightly lower values for the treated lots, and indicated that they had resulted from the presence of the talc. Of 19 contrasts of talc-treated seeds with controls, there were 15 cases in which the latter were superior and 1 case was a tie. The excess weight of the control plants averaged ± 5 percent.

**Some effects of treatment of seeds with growth substances on dormancy,** L. V. Barton (*Contrib. Boyce Thompson Inst., 11 (1940), No. 3, pp. 229–240, figs. 4*).—Treatment of dry, dormant seeds of the domestic apple (*Pyrus* sp.) and *P. malus niedzwetskyana* (=*Malus niedzwetskyana*) with growth substances in concentrations of 3.7 to 320 mg./l. had no effect on their subsequent production of seedlings. On the other hand, seeds of *Ulmus americana*, which did not require a pretreatment period at low temperature for germination but which showed improved germination capacity with such tratement, seemed to benefit by the application of solutions of 35.5, 11.8, or 3.7 mg./l. of potassium α-naphthaleneacetate. This benefit was relatively small, however, so that growth-substance treatment of these seeds could not be used as a substitute for either low-temperature pretreatment or soaking in water under a light source as a means of speeding up the germination. The germination of seeds of *Cornus florida, C. stolonifera,*

*Pyrus* sp., and *P. malus niedzwetskyana* which had been afterripened by a period at 5° C. was inhibited by treatment with growth substances. This inhibiting effect was partially removed by a second period at 5°, but abnormalities often appeared in the seedlings so produced. Growth-substance treatment of germinated seeds of *Lilium auratum*, *Paeonia suffruticosa*, and *Viburnum* sp. failed to initiate growth of the dormant epicotyls.

**Effects of two preparations of naphthylacetic acid on the germination and early growth of wheat seed damaged by formaldehyde,** N. H. GRACE (*Canad. Jour. Res., 18 (1940), No. 6, Sect. C, pp. 215–218*).—Seed of two wheat varieties was sprinkled with solutions of formaldehyde and naphthylacetic acid to give treatments of 1 and 10 parts of the latter to a million parts of seed by weight. In both varieties, formaldehyde reduced the germination rate, final count, and air-dry weight of stems and roots at 29 days after planting. Some reduction in root suppression resulted from the 1 p. p. m. concentration of growth substance, while the higher level had no observable effect. The study involved two preparations of the acid, differing only in respect to a trace of halogen in one which had no effect on final germination or stem and root weights, but increased the germination rate. The trace of halogen had the more marked effect at the higher concentration, and the Marquis variety was more affected than the Reward.

**Adventitious shoots and roots induced by natural influences and synthetic growth substances,** P. W. ZIMMERMAN and A. E. HITCHCOCK (*Contrib. Boyce Thompson Inst., 11 (1940), No. 2, pp. 127–141, figs. 5*).—Althea cuttings produced numerous adventitious shoots along the disbudded stem in contrast to cuttings with normal buds. Most of these new buds were initiated from the upper end of cuttings, the lower end producing adventitious roots. There was a relatively narrow transition zone between the regions producing shoots and those producing roots. The new organs were usually associated with proliferating lenticel tissue or on the callus formed at scars. Apparently the potential meristematic tissue was first stimulated into activity and then regulated chemically. The well-known root-inducing substances prevented initiation of shoots, inducing roots from the same tissues instead. When disbudded althea cuttings were treated with vapors of naphthalene and indole substances, root production was induced from upper, middle, and lower regions, thus disturbing the normal polarity. By separating bark from wood and otherwise mutilating cuttings, it was found that wood kept humid produced callus and then adventitious shoots from this new tissue, but not roots. Extracts of bark contained both growth-accelerating and growth-inhibiting substances. Extracts of wood induced leaf epinasty and root formation when applied to tomato plant tissue. In contrast to althea, disbudded *Populus* and *Elaeagnus* cuttings produced adventitious shoots only at the apical cut surface or at scars where buds had been removed. Althea cuttings exposed a few days to high concentrations of $CO_2$ or traces of ethylene gas and then stored in a moist chamber produced more adventitious buds than controls. It is suggested that these gases interfered with the normal metabolism and brought about a condition favoring initiation of adventitious organs. There are 19 references.

**Effects obtained with mixtures of root-inducing and other substances,** A. E. HITCHCOCK and P. W. ZIMMERMAN (*Contrib. Boyce Thompson Inst., 11 (1940), No. 2, pp. 143–160, figs. 4*).—Using many plant species and water or talc as carriers, mixtures of two or more substances were in many but not all cases more effective on cuttings than any of the individual substances alone. This greater than additive effect was characterized by increased numbers of roots, higher percentages of rooted cuttings, more uniform rooting, and other effects typical of higher concentrations of root-inducing substances. These effects were obtained with substances differing in root-inducing activity but not with those of

about equal activity. Not all genera or species of cuttings responded equally well to a given mixture. Certain mixtures of indolebutyric and α-naphthaleneacetic acids were effective on indolebutyric- and α-naphthaleneacetic-sensitive cuttings. Depending on the kind of cutting and test conditions, the following functioned as activators: Indoleacetic, indolebutyric, α-naphthaleneacetic, and phenylacetic acids, vitamins $B_1$ and $B_6$, and ethylene. Only a few of the possible combinations were tried with respect to number and kind of substances, relative proportions, and total concentration. A mixture of equal parts of two substances proved as effective (or more so) as 3- and 4-substance mixtures. In the tests reported, vitamins $B_1$ and $B_6$ functioned as activators for root formation in cuttings but not as root growth factors. Parallel tests with established plants also failed to indicate favorable effects of vitamin $B_1$ as a root growth factor, and deferred treatments were not effective on cuttings of tomato, *Taxus*, *Celastrus*, *Actinidia*, and *Hibiscus*, regardless of whether or not they had been given an initial treatment with a root-inducing substance. It is concluded that before any general practical use of vitamin $B_1$ can be recommended for soil amendment, more substantial data are needed.

**A study of the effects of different forms of colchicine on the roots of Vicia faba L.**, P. N. BHADURI (*Jour. Roy. Micros. Soc., 59 (1939), No. 4, pp. 245–276, pls. 2, figs. 30*).—The forms tested were the chemically pure alkaloid, colchicine salicylate, and crude corm and seed powder of *Colchicum autumnale*. Although the general effects were the same, the roots revived better from the action of the third form. All forms induced collapse of the spindle mechanism. After some time the blocked metaphase split chromosomes reorganized a nucleus containing the double chromosome number. Also, a large number of tetraploid nuclei were formed by fusion of two groups of chromosomes caught in early anaphase. These nuclei appeared normal with four equal-sized nucleoli, and each had a membrane. Colchicine also temporarily arrested chromosome division at the attachment constriction region. The chromosomes straightened and shortened markedly due to the action of colchicine, and their constrictions became very distinct. Cell-plate formation was stopped, even after normal anaphasic separation of the chromosomes. The resting nucleus was most resistant to colchicine action, and the resting polyploid nuclei formed after treatment had no nuclear membrane. The chromosome-nucleolus relation seemed to remain unaffected, as did the growth and division of the chromosomes, but the fluidity of the nucleolar substance increased.

Extension of the zone of vascular tissue farther toward the root tip and premature differentiation of some of the vascular tissues were common in treated roots. Early cell-wall thickening rendered the tissues more tough and leathery. Branching of the root tip at time of recovery was a peculiar feature. Linear root growth progressively slowed down during treatment. The treated cells lost their polarity and grew uniformly in all directions. Seeds beginning to germinate revived very poorly from treatment, seedling treatment, therefore, being preferable for induction of polyploids. The minimum time for producing a positive effect was 5 min. for both the pure alkaloid and the salicylate. Although there was a minimum threshold of concentration, roots reacted very differently in this respect, as did also different cells of the same root.

It is suggested that colchicine induces definite chemical reactions as a result of which a change in the colloidal state of the chromosomes and the supporting medium occurs, which inhibits spindle formation. The other changes are considered to be of secondary nature. Colchicine seems to play the role of a catalyst in this chemical reaction, which is reversible and proceeds until it attains equilibrium. For this reason increase in concentration above the mini-

mum produces but little change. The root revives if the drug is removed. When its concentration becomes lower than the threshold of strength, the cells start normal division. The erratic behavior of roots at the time of recovery is said to be due to a shock effect, causing the dividing and resting cells to remain dormant for varying periods after treatment.

**Proceedings of local branches of the Society of American Bacteriologists** (*Jour. Bact., 39 (1940), No. 6, p. 757*).—Abstracts of the following papers presented are of interest to agricultural botany: Factors Influencing the Production of Acetyl-methyl-carbinol by the Aerobic Spore-formers [*Bacillus* spp.], by N. R. Smith; and The Possible Utilization of Bacteriophage in the Classification of the Aerobic Spore-formers [*Bacillus* spp.], by R. E. Gordon (both U. S. D. A.).

**Micro-organisms and fermentation,** A. Jørgensen, rev. by A. Hansen, A. Lund, and C. A. Mitchell (*London: Charles Griffin and Co., 1939, 6. ed., rev., pp. XII+416, pls. 40, figs. 20*).—In this edition of the textbook (E. S. R., 27, p. 204), the original plan is left essentially unchanged, but throughout the mode of presentation has been brought up to date, with expansion of the discussions of some subjects and restriction in the treatment of others. The chapter headings are historical introduction, general features of the morphology and physiology of fermentation organisms, laboratory equipment, nutrient media, sterilization and disinfection, technic, molds, yeasts, bacteria, and micro-organisms in water and air. The appendix contains data on nutrient media, stains, and reagents. The word concludes with a two-page bibliography and author and subject indexes.

**Nuclei in Actinomyces,** E. H. Newcomer and G. KenKnight. (Mich. Expt. Sta.). (*Mich. Acad. Sci., Arts, and Letters, Papers, 25 (1939), pp. 85–87*).—Discrete intramycelial inclusions of nuclear morphology, which gave a positive reaction to the Feulgen technic and were interpreted as nuclei by the authors, are reported as observed in *A. viridis* and in six isolates of *Actinomyces*. Two of these isolates were from soil and three from *Actinomyces* scab lesions on potato tubers, while the sixth was from a scab lesion on a turnip root.

**The oxyhydrogen reaction in green algae and the reduction of carbon dioxide in the dark,** H. Gaffron (*Science, 91 (1940), No. 2370, pp. 529, 530*).—The experimental data presented led to the conclusion that in these algae the oxyhydrogen reaction promotes the reduction of $CO_2$ in the dark. This means that all three types of $CO_2$ assimilation observed in organisms—chemical reduction in the dark, photochemical reduction with H donors in the light, and photosynthesis as specified by the liberation of $O_2$—may occur in the same plant cell. Decomposition of $CO_2$ in plants is generally believed to be intimately linked with and dependent on the effect of light on chlorophyll. However, the results here reported suggest that the photochemical process and reduction of $CO_2$ are more widely separated reactions than has hitherto been assumed.

**An ecological effect of the New England hurricane,** M. D. Rogick (*Ohio Jour. Sci., 40 (1940), No. 3, pp. 163–167, pl. 1, fig. 1*).—Following the hurricane of September 21, 1938, an unusually high tidewater struck the general region of Woods Hole, Mass. As a result the usual collecting sites showed changes in the quantity and kinds of organisms available during the previous summers. Moreover, some of the fresh-water ponds in the lowlands near the coast became salty or brackish from flooding by sea water. Detailed data concerning the resulting changes in fauna in one of these ponds are given, particularly with regard to the replacement of fresh-water with salt- or brackish-water species of *Bryozoa*.

**Nomina generica conservanda: Contributions from the Nomenclature Committee of the British Mycological Society, II** (*Brit. Mycol. Soc. Trans., 23 (1939), pt. 3, pp. 281–292*).—This contribution includes statements concern-

ing a further 13 of the names which were proposed for conservation in the lists published as a supplement to the International Rules, 1935 (E. S. R., 75, p. 753).

**Records for the Gramineae of the Douglas Lake region, Michigan,** L. H. Harvey (*Mich. Acad. Sci., Arts, and Letters, Papers, 25 (1939), pp. 43–46*).—Collections of grasses by the author and J. H. Ehlers have added 15 species to the region, 3 of which seem to be previously unreported from the State.

**A revision of the genus Lycopersicon,** C. H. Muller (*U. S. Dept. Agr., Misc. Pub. 382 (1940), pp. 29, pls. 10*).—It is stated that 29 specific names have been applied to 5 species of the genus, most of which are here reduced to synonyms, with a few maintained as subspecific entities. New names and combinations are as follows: ***Eulycopersicon*** n. subgen., based on *L.* ***esculentum*** as type—*L.* ***esculentum*** **f.** ***pyriforme*** n. comb., based on *L.* ***pyriforme;*** ***Eriopersicon*** n. subgen., based on *L.* ***peruvianum*** as type—*L.* ***cheesmanii*** **f.** ***minor*** n. comb., based on *L.* ***esculentum minor;*** *L.* ***glandulosm*** n. sp.; *L.* ***hirsutum*** **f.** ***glabratum*** n. f.; *L.* ***peruvianum humifusum*** n. var. The genus, except for *L.* ***cheesmanii*** of the Galápagos Islands, is apparently native only in the Andean region of South America, although *L. esculentum, L. esculentum cerasiforme,* and *L.* ***pimpinellifolium*** are widely distributed in the tropics of both North and South America as well as to some extent in the Old World. These are the more edible forms of the genus. They have been widely cultivated and have frequently escaped.

**Six thistles recently introduced into Texas,** V. L. Cory. (Tex. Expt. Sta.). (*Madroño, 5 (1940), No. 6, pp. 200–202*).—Includes species of *Centaurea, Silybum, Carduus,* and *Onopordum* (=*Onopordon*).

## GENETICS

**Biological symposia,** edited by J. Cattell (*Lancaster, Pa.: Jaques Cattell Press, 1940, pp. VII+238, figs. [39]*).—Papers are presented by many of the leading authorities at the symposia on The Cell Theory, Its Past, Present, and Future; Mating Types and Their Interactions in the Ciliate Infusoria; and Chromosome Structure.

**Abstracts of papers presented at the 1939 meetings of the Genetics Society of America, Columbus, Ohio, December 28–30, 1939** (*Genetics, 25 (1940), No. 1, pp. 116, 117, 131, 132, 136, 140*).—The following are of interest to agricultural botany: Effects of Colchicine Upon the Nuclear and Cytoplasmic Phases of Cell Division in the Pollen Tube, by O. J. Eigsti; Karyotaxonomy of *Erythronium*, I, Preliminary Survey of Chromosomal Number, Morphology, and Structure of Developing Microgametophyte of [*E.*] *americanum*, by H. M. Phillips; The Developmental Basis of Inherited Size Differences in Plant Organs, by E. W. Sinnott and W. G. Whaley; and Changes in Chromosome Sensitivity to X-rays, by G. B. Wilson and B. R. Nebel (N. Y. State Expt. Sta.).

**The relation of genetics to geographical distribution and speciation; speciation, I, II** (*Amer. Nat., 74 (1940), Nos. 752, pp. 193–278, figs. 12; 753, pp. 289–321*).—The following papers on speciation and the relation of genetics to geographical distribution, presented before the joint sections of the American Association for the Advancement of Science, showed that speciation is no aimless wandering of genes through the organic world but rather is an orderly adjustment under the rigid control of environment. The papers are as follows: Introduction, by L. J. Cole (pp. 193–197) (Univ. Wis.); Speciation of Fishes, by C. L. Hubbs (pp. 198–211); Ecologic and Genetic Variability Within Species of *Peromyscus*, by L. R. Dice (pp. 212–221); Speciation From the Point of View of Genetics, by M. R. Irwin and R. W. Cumley (pp. 222–231) (Wis. Expt. Sta.);

Breeding Structure of Populations in Relation to Speciation, by S. Wright (pp. 232–248); Speciation Phenomena in Birds, by E. Mayr (pp. 249–278); Speciation in *Peromyscus*, by L. R. Dice (pp. 289–298); Levels of Divergence in *Drosophila* Speciation, by W. P. Spencer (pp. 299–311); and Speciation as a Stage in Evolutionary Divergence, by T. Dobzhansky (pp. 312–321).

**Plant breeding in agronomy section outlined; several crops discussed,** D. W. ROBERTSON. (Partly coop. U. S. D. A.). (*Colo. Farm Bul.* [*Colorado Sta.*], *2* (*1940*), *No. 3, pp. 6–8*).—Problems, current objectives, and methods in crop improvement are discussed for wheat, oats, barley, corn, alfalfa, sugar beets, sorghums, and Sudan grass.

**Genetic and cytologic studies of a brachytic mutation in barley,** S. P. SWENSON. (Minn. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *60* (*1940*), *No. 10, pp. 687–713, figs. 11*).—Further studies on the inheritance of the brachytic habit of growth, carried on earlier by Powers (E. S. R., 80, p. 174), are reported, with considerations of linkage relationships of the gene for brachytic (*br*), the cytological nature of the mutation, and the nature of the action of *br* with respect to plant and organ size, cell size and number, growth rate, and frequency of cell division.

The gene for brachytic habit of growth behaves as a simple Mendelian recessive to the gene for normal growth habit, and *Br br* was found to be independent of the first six linkage groups and definitely associated with $F_c f_c$ (chlorina) in the seventh group. The linkage intensity between these two pairs was determined from repulsion data. The cross-over value from $F_3$ data, considered more reliable than that from $F_2$, was 9.27±0.90 percent. Chromosomes in Brachytic were as regular in appearance, behavior, and number as in the normal Himalaya and B4 barleys. The character was not associated with any observable change in chromosome structure, more likely being the result of gene mutation.

Brachytic grows about two-thirds as tall as Himalaya, from which it mutated, has leaf sheaths about two-thirds as long, awns about one-half as long, and a similar number of seeds per plant, although Brachytic seeds are about 85 percent as heavy.

Length of cells in comparable field-grown plants was found similar in the two strains, number of cells being proportional to length of plant and its parts. Epidermal cells were longer and narrower in the tip than in the middle and basal regions of the leaves and in older than in younger leaves. Plumules and primary roots of Himalaya were about twice as long as those of Brachytic, yet no significant differences were obtained for cell size in comparable parts. Primary roots of Brachytic were larger in diameter than those of Himalaya, the difference being associated with number rather than with width of cells. The cells in primary leaves and roots increased progressively in size at increasing distances from the meristematic region. Brachytic grew 65.19 percent as tall as Himalaya, with the difference in daily amounts of growth remaining fairly constant. Factors for differentiation and maturity appeared to act independently of that for growth rate. Himalaya had a longer and narrower meristematic region in sections of root tips, but the total area per section was similar in both varieties. Indications were that Himalaya has a higher frequency of mitosis per section of meristematic region and number of mitoses per square millimeter. The rate of cell division and elongation might be expected to be higher in Himalaya. The results indicated that cell formation is subordinate to the development of the organism as a whole.

**A male sterile character in barley: A new tool for the plant breeder,** C. A. SUNESON. (U. S. D. A. and Calif. Expt. Sta.). (*Jour. Hered.*, *31* (*1940*), *No. 5, pp. 213, 214*).—The type of male sterility in barley described, in which

florets contained shrunken, rudimentary anthers and normal pistillate flower parts, was shown by segregations in $F_2$ to result from the action of a single recessive gene. It might be useful in breeding work.

**Effect of the method of combining the four inbred lines of a double cross of maize upon the yield and variability of the resulting hybrid,** R. C. Eckhardt and A. A. Bryan. (Iowa Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 5, pp. 347–353*).—In double crosses involving two inbreds from each of two corn varieties, combinations bringing together inbreds of the same variety in the parental single crosses were consistently the higher yielding. The highest yielding double crosses were those combining single crosses of widely different parentage. Significantly lower variances for ear height and ear length resulted from combining two inbreds from the same variety in each single cross parent. While lower variances were also found for plant height and ear weight, differences associated with method of combining were not significant.

**Chromosome aberrations in the endosperm of maize,** F. J. Clark and F. C. Copeland. (Conn. [New Haven] Expt. Sta. et al.). (*Amer. Jour. Bot., 27 (1940), No. 4, pp. 247–251, figs. 11*).—Aberrant mitotic divisions were observed in endosperm tissue in stocks of corn giving high rates of mosaic formation. The frequencies of abnormal anaphases, such as single bridges and fragments, bridges alone, fragments alone, and double bridges, ranged from 2.5 to 13.2 percent in the plants used. Possible correlation of chromosomal aberrations and observed genetic variegation is discussed. The chromosomal break-fusion mechanism evidently can account for unstable types of changes in the endosperm.

**The origin of American tetraploid Gossypium species,** J. O. Beasley. (U. S. D. A.). (*Amer. Nat., 74 (1940), No. 752, pp. 285, 286*).—The meiotic chromosome behavior and other features in hybrids between the synthesized tetraploid and natural tetraploids support Skovsted's hypothesis (E. S. R., 71, p. 457; 79, p. 31) that 26-chromosome *Gossypium* species were allotetraploids with one of the original species similar to Asiatic and the other similar to American 13-chromosome species.

**The effect of chromosome doubling on the crossability of Solanum chacoense, S. jamesii, and S. bulbocastanum with S. tuberosum,** J. R. Livermore and F. E. Johnstone, Jr. (Cornell Univ.). (*Amer. Potato Jour., 17 (1940), No. 7, pp. 170–173*).—When *S. jamesii* was crossed with diploids or with tetraploids, no seeds were obtained. From the crosses involving *S. bulbocastanum*, only one small seed, which may or may not be viable, was produced. With *S. chacoense*, however, a few seed were obtained in $2n$ crosses and many more in the $4n$ crosses. The average in a seed ball was 1.2 for $2n$ and 30.6 for $4n$. The reciprocal crosses of Earlaine × *S. chacoense* $4n$ were successful. In all three species, the percentage of viable pollen in diploids was higher than in tetraploids. In general, diploids contained more than 90 percent viable pollen, whereas tetraploids of *S. bulbocastanum* and *S. jamesii* averaged about 60 percent and those of *S. chacoense* seldom more than 10 percent. The quantity of pollen in the anthers of the tetraploids was less than in those of the diploids. See also an earlier note (E. S. R., 82, p. 318).

**Inheritance and linkage relationships of a chlorophyll mutation in rice,** N. E. Jodon. (U. S. D. A. and La. Expt. Sta.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 5, pp. 342–346, figs. 2*).—A recessive virescent mutation (*v*) appeared in an $F_4$ Kameji × Blue Rose progeny row. In the $F_2$ of No. 2912A21 (virescent) × C. I. 4630 (normal), virescence was found to be linked with three other recessives in the order glutinous (*gu*), colorless apiculus (*as*), virescent

(*v*), and noncluster (*cl*). A maturity factor (*fl*) appeared to be linked closely with virescent, but the relative position was not determined.

**Effect of awns on kernel weight, test weight, and yield of wheat,** B. B. Bayles and C. A. Suneson. (U. S. D. A. coop. 8 expt. stas.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 5, pp. 382–388*).—Composited populations of homozygous awnless or awnleted and of awned plant segregates from Triplet × Oro and Baart × Onas wheat were grown in adjacent replicated nursery plats 5 and 4 yr., respectively, at several widely separated western experiment stations. Grain from the composite of awned plants surpassed that from the composite of awnless or awnleted plants in both kernel weight and test weight per bushel for each cross regardless of environment. The two composites from the winter wheat cross, Triplet × Oro, did not yield significantly different, but in the spring wheat cross, Baart × Onas, the awned composite outyielded the awnless or awnleted composite in 2 of 4 yr.

**A study of nicking in Jersey cattle,** L. A. Johnson, J. W. Bartlett, and L. Copeland. (Univ. N. H., N. J. Expt. Stas., et al.). (*Jour. Dairy Sci., 23 (1940), No. 8, pp. 709–718*).—Analysis of the fat production records of the daughters of 17 Jersey bulls grouped according to grandsires showed that these sires nicked better with certain progeny than with others. Many factors, such as environment, also needed to be considered. Therefore, no very positive views regarding the operation of nicking could be made with the numbers of individuals furnishing the basic data and the variations found.

**Twins, but not full sisters,** E. L. Vieth. (Iowa State Col.). (*Jour. Hered., 31 (1940), No. 7, p. 306, fig. 1*).—An account is given of a cow which produced twin calves following double mating with bulls of the Aberdeen Angus and Hereford breeds. One of the calves showed characteristics of the former and the other of the latter breed.

**Inheritance of horns and scurs in sheep,** H. L. Ibsen and R. F. Cox. (Kans. Expt. Sta.). (*Jour. Hered., 31 (1940), No. 7, pp. 327–336, figs. 2*).—A theory is presented to explain the inheritance of horns and scurs, based in part on data from Arkell (E. S. R., 28, p. 267) and from Warwick (E. S. R., 82, p. 320) and on correspondence with J. P. Willman. The operation is suggested of four pairs of genes, as follows: (1) *H* for horns and its allel *P* for polled (*HP* producing horned ♂♂ and hornless ♀♀); (2) *hm*, horn modifier, causing horned ♂♂ and hornless ♀♀; (3) *Ih* for horn inhibition, which causes skull depressions of the horn region in both sexes; and (4) *Sc* for scurs, incompletely dominant. Homozygous dominants had longer scurs than heterozygotes. There were no scurs on horned or *scsc* animals. *Ih* prevented the occurrence of scurs in heterozygous ♀♀.

**Development of the Notail sheep,** J. W. Wilson (*South Dakota Sta. Cir. 28 (1940), pp. 22, figs. 16*).—Progress is described on the development of a strain of sheep with no tails or tails sufficiently short that docking was not required. The flock originated in 1913 by mating fat-rumped rams from Siberia with purebred and grade Shropshire, Cheviot, and Hampshire ewes. In 1926, 100 western crossbred Rambouillet ewes were mated with 10 no-tail rams to improve the quality of the fleece. In the no-tail flock there was improvement in the elimination of the tail so that in 1939 most of the progeny had tails under 1.5 in. or no tails at all. None of the rams would eliminate the tails from the progeny of the first cross with other breeds and strains, but in the backcrosses only a very small proportion of the lambs needed docking.

**Wild × domestic sheep crosses,** B. L. Warwick, R. O. Berry, and S. P. Davis. (Tex. Expt. Sta.). (*Southwest. Sheep and Goat Raiser, 10 (1940), No. 6, pp. 30, 31, figs. 6*).—The authors call attention to the occurrence of short tails

among all the wild species of true sheep, but wild sheep (such as the moufion) have *no wool of commercial value*. Since *crosses of the moufion with domestic* sheep have produced fertile offspring, the transference of desirable genes from the wild to the domestic sheep seems possible.

**[Studies on the genetics of Rhode Island Reds]**, F. A. HAYS and R. SANBORN (*Massachusetts Sta. Bul. 369 (1940), pp. 89–91*).—Brief reports are presented on progress in studies of the inheritance of the presence and absence of broodiness; relation of Rhode Island Red color to fecundity and early dorsal feather growth; selective breeding to reduce mortality; and improvement of fecundity through development of a line genetically pure for maturity at 180–215 days of age, elimination of winter pause, and high persistency.

**The correlation of the condition of the uterine cervix to the reaction of the mares to teasing**, M. M. ROBLES (*Philippine Jour. Anim. Indus., 7 (1940), No. 1, pp. 21–29, pl. 1, fig. 1*).—Correlation between the condition of the cervix in 521 mares and their reaction to teasing showed complete agreement in those designated as highly positive or highly negative, but there was less agreement between mares designated as doubtful or uncertain by either of the tests. Differences in the response to a teaser stallion were so great as to make *determination of heat by this method unreliable.*

**Some observations on a chemical test for pregnancy in mares**, L. B. SHOLL and G. E. DERSHAM. (Mich. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 95 (1939), No. 751, pp. 507, 508*).—Chemical tests for pregnancy by the method of E. Cuboni[7] were made on the urine of 17 mares at from 59 to 192 days after conception. Tests were negative under 80 days, but positive results were usually obtained after 90 days.

**An artificial vagina for controlled-temperature studies of bull semen**, G. W. SALISBURY and E. L. WILLETT. (Cornell Univ.). (*Cornell Vet., 30 (1940), No. 1, pp. 25–29, fig. 1*).—An artificial vagina for use in semen collections for artificially inseminating dairy cattle is described. It consisted of a test tube inserted in a rubber hose and surrounded by warm water.

**Observations on the oestrous cycle of the guinea-pig**, P. BACSICH and G. M. WYBURN (*Roy. Soc. Edinb. Proc., 60 (1939–40), No. 1, pp. 33–39, figs. 3*).—Study of 100 oestrous cycles in 35 virgin ♀ guinea pigs by the smear method showed the cycles to average 16 days in duration and oestrus to average 50 hr. in length. *Climatic, domestic, and genetic variations are suggested in explanation of* marked differences in the duration of the oestrous cycle in this animal as observed by other workers.

***Experimental studies of the anterior pituitary*, IV, V** (*Endocrinology, 21 (1937), No. 1, pp. 30–39, figs. 3; 26 (1940), No. 6, pp. 979–985, figs. 14*).—In continuation of this series (E. S. R., 69, p. 642), two papers are presented, as follows:

IV. *The replacement capacity and the noncyclic behavior of homoplastic anterior pituitary grafts*, M. Schweizer, H. A. Charipper, and H. O. Haterius.—Intraocular implants attached to the pupillary margin of the iris and extraocular implants in the lateral subconjunctival tissues became dominantly basophilic and retained their gonadotropic capacity in completely hypophysectomized guinea pigs. The ovaries became progressively more follicular until, after approximately 2 mo., a condition of constant oestrus supervened. On the basis of these observations the conclusions are advanced that the hypophyseal grafts were functional in maintaining the ovaries in the follicular phase and that the guinea pig pituitary when transplanted to a site removed from its normal anatomical position lost its cyclic character.

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[7] Klin. Wchnschr., 13 (1934), No. 8, pp. 302, 303.

V. *Functional activity of anterior pituitary grafts in the adult male guinea pig*, M. Schweizer, H. A. Charipper, and W. Kleinberg.—Anterior pituitaries from normal ♂♂ and ♀♀ were grafted into the eye chamber of hypophysectomized adult ♂ guinea pigs. The reproductive elements and interstitial cells of all the hypophysectomized animals were stimulated by the implants, and spermatogenesis was well maintained, as indicated by the electric ejaculation test. It seemed to make no difference whether the pituitary grafts were from ♂♂ or ♀♀.

**Presence of the sperm middle-piece in the fertilized egg of the mouse (Mus musculus)**, R. A. R. Gresson (*Nature [London], 145 (1940), No. 3672, p. 425, fig. 1*).—After the stage of pronucleus formation was reached, the spermatozoon middle piece was usually found detached from the sperm head. The sperm mitochondria became similar in size and staining properties to those of the egg and were distributed in approximately equal numbers in the first two blastomeres.

**The tolerance of male and female mice, respectively, to estrogens and androgens**, C. D. Kochakian (*Endocrinology, 26 (1940), No. 1, pp. 54–60, figs. 4*).—Immature mice injected daily with ♂ and ♀ hormones showed that testosterone was more injurious to ♂♂ than to ♀♀, though not fatal. The opposite result in the two sexes was found with oestrogen.

**The effects of Antuitrin-S, progestin, and a vital dye on late pregnancy in the rat**, R. M. Coco. (La. State Univ.). (*Endocrinology, 26 (1940), No. 6, pp. 1057–1063, figs. 4*).—The effects of Antuitrin-S, progestin, and dianil blue injected in pregnancy on parturition and the occurrence of fetal mortality were studied in rats. The results varied with the dosages and the time of injection, but, in general, Antuitrin-S on the eighteenth day of gestation resulted, in nearly all cases, in the birth of living or dead young at term without postponing parturition. Doses earlier than the nineteenth day of gestation usually resulted in the postponement of parturition and, in some instances, prolonged it from 1 to 5 days. Injections of from 75 to 100 rat units of Antuitrin-S on the eighteenth day of pregnancy caused luteinization of mature follicles, but such luteal tissues did not become functional enough to prolong gestation. Progestin late in pregnancy did not prolong gestation. Injections of dianil blue during pregnancy proved toxic to the fetuses.

**The effect of testosterone, estrone, and estradiol applied locally to the penis of the rat**, H. S. Wigodsky and R. R. Greene (*Endocrinology, 26 (1940), No. 6, pp. 1078–1080*).—Administration by local application or subcutaneous injection of 7.5$\gamma$ of testosterone for 10 days caused an increase of nearly 10 percent in the length and nearly 50 percent in the weight of the penis, as compared with the controls. Oestradiol and oestrone percutaneously applied had no significant effect on the size or weight of the organ.

**Response of hypophysectomized rats to highly purified extracts of pregnant mare serum**, R. I. Pencharz, H. H. Cole, and H. Goss. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 43 (1940), No. 3, pp. 432, 433*).—Two pregnant-mare serum extracts, highly purified and containing only small amounts of inert material, were found to give good follicular response and increases in the weight of the ovaries of immature, hypophysectomized ♀♀ and a very strong interstitial-cell response in the testes, seminal vesicles, and prostates of hypophysectomized ♂♂.

**Inactivation of pituitary lactogenic hormone by iodine**, C. H. Li, W. R. Lyons, M. E. Simpson, and H. M. Evans. (Univ. Calif.). (*Science, 91 (1940), No. 2370, pp. 530, 531*).—Decrease in the potency of lactogenic solutions in pigeon crop-gland tests was associated with increased iodine absorption by thiosulfate.

The essentiality of both tyrosine and free amino groups for the action of the lactogenic hormone was thus demonstrated.

**The yield and composition of the milk of dairy cows and goats as influenced by thyroxine,** N. P. Ralston, W. C. Cowsert, A. C. Ragsdale, H. A. Herman, and C. W. Turner. (Coop. Miss. Expt. Sta.). (*Missouri Sta. Res. Bul. 317 (1940), pp. 75, figs. 33*).—Results of two series of experiments are summarized. In part 1, a total of 18 cows, including representatives of 3 dairy breeds, received injections of 15 mg. of thyroxine in alkaline solution on 3 successive days of each month of the lactation period. Average increases in milk yield, butterfat yield, and percentages of butterfat in the milk due to thyroxine administration were 13.6, 22.18, and 4.73, respectively. Milk and fat production reached a maximum 6–8 days after injection was started and gradually returned to a normal level between the twelfth and the fourteenth day. A rise in pulse rate (average increase, 7.64 beats per minute) closely paralleled the increase in milk yield. The response to thyroxine was greater during the declining phase of lactation, including the second to the eighth months, than at the peak of production. A seasonal variation in response was also observed, with smaller responses occurring in April and in October than during other months of the year. Goats in advanced stages of lactation also showed a marked response to thyroxine administration. Electrocardiographic studies of 2 cows which had received 15 mg. of thyroxine daily for 3 successive days showed no indication of heart damage, but results with goats were conflicting.

In part 2, similar investigations conducted at the Mississippi Experiment Station on 10 dairy cows are reported which confirmed the findings on the stimulating effect of thyroxine on the milk and butterfat production. The solids-not-fat content of the milk showed much variation between both experiments and between individual cows.

A review of the literature and an extensive bibliography are included.

## FIELD CROPS

**[Field crops work in Massachusetts],** W. S. Eisenmenger, K. J. Kucinski, R. W. Donaldson, W. G. Colby, and C. E. Cross (*Massachusetts Sta. Bul. 369 (1940), pp. 8, 14–16, 37, 38, 52, fig. 1*).—Brief reports are made again (E. S. R., 81, p. 501) on field crops experiments concerned with efforts to overcome the unfavorable effects on tobacco yield and quality usually noted when old sod is plowed under preceding tobacco; planting, fertilizer, and production tests with sunflowers; trials of hay seeding mixtures and effects of potash dressings on meadows; pasture experiments, including tillage, fertilizer, reseeding, and grazing management studies; and control of weeds and shrubs of cranberry bogs.

**[Farm crops experiments in Mississippi]** (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 7, pp. 1, 7, fig. 1*).—Articles entitled Hay Crops Will Ripen—Little Else, by H. W. Bennett (p. 1); and Summer Legumes Plowed Under Increase Yields of Cotton, Corn in Delta Branch Station Tests, by R. Kuykendall (p. 7), report progress from farm crops studies.

**[Field crops work in Nebraska].** (Partly coop. U. S. D. A. et al.). (*Nebraska Sta. Rpt. [1939], pp. 9–12, 13–23, 24, 25, 30, 54, 55, 58, 59, 60, 61*).—Experiments with field crops (E. S. R., 81, p. 639) reported on from the station and substations included variety tests with winter and spring wheat, corn, oats, barley, grain sorghums, sorgo, alfalfa, sweetclover, soybeans, potatoes, and Jerusalem-artichokes; breeding work with corn (and hybrids), sorghum, wheat, oats, barley,

alfalfa, sweetclover, bromegrass, and potatoes; interspecific hybridization and inheritance of green cotyledon color and dwarf branching habit in sweetclover; crop rotations; response of wheat, sorghum, and spring grains to fallow and other tillage practices; the influence of manure, alfalfa, pastured sweetclover, and phosphate on yields of irrigated crops; nutrition and heat endurance studies with potatoes; drying seed corn with heated air under forced draft (E. S. R., 81, p. 778); planting tests with corn, wheat, oats, barley, sorghum, soybeans, and sweetclover; comparative forage yields of soybeans, alfalfa, and sorgo (E. S. R., 82, p. 479); studies of seed setting in alfalfa and bromegrass; a clipping test and coumarin determination with sweetclover; surface v. furrow drilling of wheat, oats, and barley; cold resistance of wheat as affected by defoliation, bunt, and variety; improvement of permanent pastures and meadows by improvement of species for reseeding, tests of forage grasses and legumes, response of grasses to intensity of clipping, and a range survey in a sand hill area; and control of bindweed by cultivation, smother crops rotations, and sodium chlorate and other chemicals.

**[Field crops and pasture research in New Hampshire]** (*New Hampshire Sta. Bul. 319 (1940), pp. 19–21, 23, 26, 27*).—Progress reports are made again (E. S. R., 82, p. 175), on agronomic experiments variously participated in by F. S. Prince, P. T. Blood, L. J. Higgins, T. G. Phillips, G. P. Percival, P. N. Scripture, and S. Dunn, and including tests with legumes on neglected hay lands; a dairy farm rotation in southern New Hampshire with sweet corn as cash crop; crop responses in a 3-yr. fertilized rotation of potatoes, oats, and hay; a fertilizer experiment with clover-timothy hay in the Connecticut Valley; effect of soil moisture and fertilizer placement on the vitality of the potato seed piece; a top dressing experiment on old pastures; and a study of pasture grasses and legumes pure and in mixtures.

**Field-crop experiments at Las Vegas, 1937–1939,** J. Carter, Jr. (*New Mexico Sta. Bul. 271 (1940), pp. 11, figs. 8*).—Varietal leaders in tests at 6,400 ft. elevation on black heavy soil under limited irrigation and their average acre yields included corn, Hays Golden 36.6 and Colorado No. 13 28 bu.; grain sorghum Early Kalo 12.6 and hegari 7.5 bu.; sorgo, Early Sumac 3.5 and Leoti Red 3.4 tons; annual hay crops, Siberian millet 1.91, field peas and oats 1.88, and Sudan grass 1.79 tons; pinto beans, strain 247 596.3 and Huddleston strain 579.4 lb.; and alfalfa, common 1.96 and Ladak 1.66 tons per acre. Silage from Colorado No. 13 corn 5.9 and Leoti Red sorgo 6.2 tons per acre was much better in quality due to advanced stage of maturity than that made from Ensilage corn, 7.1, or Atlas sorgo, 6.8 tons. Better hay was produced by field pea combinations than by any other annual hay crops. Range grasses under study are listed.

**Review and discussion of literature pertinent to crop rotations for erodible soils,** C. R. Enlow (*U. S. Dept. Agr. Cir. 559 (1939), pp. 51, figs. 14*).—Information derived from the review of 158 listed publications has been compiled and discussed, with particular reference to the nature of and losses in soil organic matter, crop sequence, and the results reported from rotation experiments at State, Federal, and conservation experiment stations in the northern Great Plains, Corn Belt, and Northeastern and Southeastern States. Sections are also devoted to rotations on the contour, grass-legume mixtures, and rotations recommended for erodible soils. Merits of current practices are evaluated, with comments on needs for specific information on practices and crops in the several regions.

**Effects of interplanting legumes in corn,** C. K. McClelland (*Arkansas Sta. Bul. 393 (1940), pp. 29, figs. 3*).—The effects of interplanting legumes in corn on the corn yields and on the yields of succeeding crops were studied, 1926–38, at the station, the Cotton Substation, and the experimental field at Scott.

As to yields of legumes, the most consistently successful method was to plant them in the row with corn at corn planting time, and the next best practice was to widen corn rows from 44 to 57 in. and plant the legumes in the middles when corn was waist high. Interplanting of legumes usually resulted in reduced corn yields—in the rows (A) an average reduction of 19.4 percent, in middles at laying-by time (B) 4.03 percent, and in middles of 57-in. corn rows (C) 7.54 percent, partly due to reduction of stand from 6,480 to 5,040 stalks per acre. The largest reduction in corn yields at Scott was with interplanted soybeans, at the Cotton Substation with velvetbeans, and at the station with mung beans.

Cotton yields at Scott increased 13.8 percent after (A), 2.7 percent following (B), and 2.5 percent after (C). Most consistent gains were obtained on cowpea plats and the least on the soybean plats, although cotton after soybeans in corn rows yielded 12 percent more than after corn alone. At the Cotton Substation, gains in cotton yields were 24.7 percent when cotton followed (A), 7.3 percent after (B), and 8.2 percent after (C). Velvet beans in the corn rows produced the highest gains, and soybeans similarly planted were second. In spite of the growing of legumes in corn, corn yields showed a downward trend, attributed to continuously clean cultivation, nonuse of cover crops, and lack of rotation with small grain, grass, or other solid planted crops, which would allow the land some rest from tillage.

At the station, oats yields following (A) were increased 5.9 percent but were reduced following the other methods. Oats yields were reduced after soybeans in wide middles of corn and on all plats after mung beans. Here too, although oats have been used in the rotation with corn and legumes, the trend of corn yields has been downward, due in part to unfavorable seasons.

Yields of dry forage from interplanted legumes varied from 0 to 2.4 tons per acre, the higher yields being made by legumes planted early and in corn rows. When the legumes were planted in middles at laying-by time, there were so many failures of stand, or such small growth, that the method was of doubtful value.

**Placement of dolomite, superphosphate, and basic slag for soybeans, Austrian winter peas, and vetch,** W. B. Andrews. (Miss. Expt. Sta.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 5, pp. 337–341*).—Hay yields indicated that placing the 1:1 mixture of dolomite and superphosphate (400 lb. per acre) 2 in. to one side and from 2 to 3 in. below soybean and Austrian winter pea seed was superior to contact placement. Potassium chloride in contact with the seed decreased the yield. The best placement was dolomite in contact and superphosphate below and to the side of the seed. Indications were that separating the dolomite and superphosphate prevented undesirable chemical reactions and stimulated nodule bacteria. In general, the placement producing the highest yield of soybeans resulted in the highest nitrogen content, but placement had no effect on the nitrogen content of Austrian winter peas. Basic slag (400 lb. per acre) placed in contact with or below vetch seed was superior to side placements.

**Pasture top-dressing in New Hampshire,** F. S. Prince, G. P. Percival, P. T. Blood, and P. N. Scripture (*New Hampshire Sta. Bul. 320 (1940), pp. 24, figs. 3*).—Top dressing experiments (E. S. R., 73, p. 773) continued on pastures near Stratham on Charlton soil and in Claremont on Sutton soil are reported on with evaluations of factors involved and suggestions on the use of fertilizers on pastures and the maintenance of soil fertility.

Response of pasture sods to fertilizers and lime seemed to be governed by moisture relationships of the soil, the lighter, drier soils responding mainly to nitrogen and the heavier, moister soils to all the nutrients and lime because

wild white clover forms a component part of the sod on such soils under proper treatment. Farmers appear to be justified in using lime and superhosphate in beginning pasture improvement on the heavier soils. After these materials improve the sod, potash should be added to the fertilizer for maximum results and also nitrogen, if there is a pasture shortage in spring as through summer and fall. The results in the Connecticut Valley in both pasture and hay production suggest that potash exerts a more beneficial effect on clover growth than any other material. Nitrogen has been consistent in producing more forage on both light and heavy soils in these tests reported. The principal response from nitrogen applied in the spring has come soon after application in spring and in early summer. Variation in response to different nitrogen carriers prevented definite recommendations. A heavy triennial application of superphosphate on the pasture near Stratham gave better returns over a period of years than a light annual treatment, with equal amounts of phosphoric acid applied, but with potash the annual light treatment was superior.

Pastures under test yielded about 1,300 lb. more dry matter per acre in the wet season of 1938 than in the dry season of 1939 with the same treatments, suggesting that moisture is an important factor in pasture production and emphasizing the need for choosing a heavy, well-watered soil for treatment. As an average, $1 invested in fertilizers used on these pastures has brought in about $2 worth of feed, a return apparently ample to warrant the practice.

**The chemical composition of pasture species of the northeast region as influenced by fertilizers, B. A. Brown.** ([Conn.] Storrs Expt. Sta.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 4, pp. 256–265, figs. 3*).—In another phase of the station's pasture program (E. S. R., 81, p. 776), analyses of over 300 samples of pasturage from 17 variously fertilized permanent, grazed plats were made from 1932 to 1936. Fertilizers ranged from superphosphate alone to complete minerals (PLK) plus 84 lb. of N per acre annually. Superphosphate caused the greatest improvement in important nutritional characteristics, namely, a 25-percent increase in protein, a 5-percent decrease in fiber, and a 50-percent increase in P. In these respects, further advances were attributed to adding limestone and/or nitrogenous fertilizers with superphosphate. Superphosphate (16 percent) at 500 lb. per acre in 1924 was responsible for a 40-percent increase in the P in the pasturage in 1938. The Ca : P ratios varied from 1.4 for the PLK plus high N plats to 2.9 for the nonphosphated pastures. The Si, Fe, and Al contents of the unfertilized vegetation were each approximately double those found in the P or P+ pasturage. Mn was consistently 60 percent higher in the grasses from the unlimed plats. S, Cl, and Mg did not vary so much as the elements mentioned above, and the effects of fertilization were much less evident. Intraseasonal variations in composition of samples from the same plat were equivalent to 25 percent frequently and 40 percent occasionally of the annual means, illustrating the difficulty of obtaining fresh pasturage of uniform quality for feeding trials.

The N content of timothy, mowed June 1, was not increased by 28 lb. of N but was raised by 56 lb. of N per acre applied annually in April. In this case, early cutting was much more important than nitrogenous fertilizers. On seeded, lawn-mowed plats, the N, P, K, Ca, and Mg contents of pure stands of Kentucky bluegrass and Rhode Island bentgrass were influenced appreciably by the source of fertilizer nitrogen. Materials carrying Na increased the K in the grasses, while magnesic fertilizers had the opposite effect. On this soil (pH 5.3), the use of physiologically neutral or alkaline N carriers resulted in higher N, P, and Ca contents in the grasses.

**A comparison of yields and composition of some Illinois pasture plants,** R. F. FUELLEMAN *and* W. L. BURLISON. (Ill. Expt. Sta.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 4, pp. 243–255*).—Yields of oven-dry forage were obtained, 1935–37, from reed canary grass, bromegrass, Kentucky bluegrass, and orchard grass pastures at Urbana, Ill. Analyses as tabulated show the protein, calcium, and phosphorus contents of these grasses when sampled as follows: A, herbage plucked or clipped under a cage placed over a representative grazed area at a previous sampling date or when cattle were turned in; C, harvested from a representative grazed area; and B, herbage harvested from beneath the cage placed on the C area on the previous sampling date.

Bromegrass has yielded more oven-dry forage and total digestible nutrients per acre than these other grasses. On the basis of percentage composition, Kentucky bluegrass usually contains more digestible nutrients per pound than the other three grasses. The considerable variability in composition found in the same species in different seasons was apparently a seasonal effect due in part to previous management, to type of livestock used, or to the physiological effects of environment, more specifically precipitation and temperature. Data on the chemical composition of these forage grasses are expressed in the form of hyperbolic curves, the reverse of the seasonal temperature curves which were in the form of parabolas. Yields as calculated by the A and B methods usually varied from each other depending on season and previous treatment. Following the season of 1936, forage yields of a bunch type, as orchard grass, showed larger differences between A and B yields than did the sod-forming bluegrass and bromegrass. See also a previous note (E. S. R., 81, p. 777).

**The influence of grazing upon certain soil and climatic conditions in farm woodlands,** R. F. CHANDLER, JR. (Cornell Univ.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 3, pp. 216–230, figs. 6*).—Measurements of soil and climatic conditions in 18 paired grazed and ungrazed woodland areas in central New York revealed the higher contents of soil organic matter and soil moisture, higher moisture equivalent, and higher relative humidity on ungrazed soils, and the higher volume weight of soil, higher air and soil temperatures, and greater amount of light penetrating forest canopy on grazed soils. No significant differences were found in the pH of the surface soil.

**Effects of grazing upon bunch wheat grass,** W. R. HANSON and L. A. STODDART. (Utah Expt. Sta.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 4, pp. 278–289, figs. 4*).—Bunch wheatgrass (*Agropyron inerme*) was studied on protected and heavily grazed areas on range land in Cache Valley, Utah, to compare root development, herbage and seed production, and content of sugar, starch, and hemicellulose in roots and stem bases.

The habits of growth of the roots are well adapted to its habitat and insure the species a place as dominant in the area studied. The soil mass below normal plants was thoroughly permeated from a depth about 5 cm. to as deep as 180 cm. Root weight was 13.1 times the top weight. The weight of roots per cubic decimeter of soil averaged 25.85 gm. on protected range and 4.22 gm. on heavily grazed range. Maximum depth of roots of grazed plants was reduced materially. A very marked decrease in the above ground parts accompanied overgrazing, as was shown by reduced basal area, height, and number of seed stalks. Germination tests of filled florets from protected and heavily grazed range showed no significant difference. On protected range 88.8 percent of the florets matured viable seeds and on heavily grazed range 23.9 percent matured, and the respective seed production was 630.2 and 12.2 viable seeds per square meter of ground. Stem bases and roots of protected plants contained 17.77 percent sugar and

starch, while those of plants grazed heavily contained 14.33 percent. The hemicellulose content was not significantly different. Evidently *A. inerme* could have been, and probably was formerly, dominant on much range land in Cache Valley where it is at present scarce or wanting. Sustained yield of *A. inerme* depends predominantly upon extent, intensity of ramification, and carbohydrate content of the root system.

**Inflorescence variations in buffalo grass, Buchloe dactyloides,** L. E. WENGER. (Kans. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 4, pp. 274–277, figs. 3*).—A number of offtype inflorescences occurring in dioecious plants observed at Fort Hays, Kans., are described.

**Leaf pigment concentration and its relation to yield in Fairway crested wheat grass and Parkland brome grass,** I. J. JOHNSON and E. S. MILLER. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 4, pp. 302–307*).—Widely significant differences were found in percentage of total carotenoid pigments, β-carotene, and total chlorophyll in a study of 55 clonal lines of Fairway crested wheatgrass and 76 clonal lines of Parkland bromegrass. The strains studied also varied significantly in yield on a green weight basis. No significant relationship was noted between the concentration of chlorophyll or carotenoid pigments and yielding ability. Significant correlations were obtained between the concentration of total chlorophyll and either total carotenoids or β-carotene.

**Germination of seed of goosegrass, Eleusine indica,** E. H. and V. K. TOOLE. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 4, pp. 320, 321*).—Test results indicated that from 20° to 30° C. or from 25° to 40° alternations seems to be the most favorable temperatures for germination. Potassium nitrate is beneficial, and light is needed if potassium nitrate is not used. Complete germination at from 20° to 35° with potassium nitrate required from 28 to 84 days, depending upon the maturity and the age of the seed.

**Effect of frequency of cutting on the growth, yield, and composition of Napier grass,** C. P. WILSIE, E. K. AKAMINE, and M. TAKAHASHI. (Hawaii Expt. Sta.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 4, pp. 266–273, figs. 2*).—Napier grass was harvested uniformly February 19, 1935, and plats were cut every 6, 8, 10, 12, and 14 weeks thereafter until November 23, 1937, 144 weeks later. An increase in the interval between harvests resulted in a higher total forage yield. Dry matter yields arranged themselves in the decreasing order 14-week cutting interval, 12-week, 10-week, 8-week, 6-week. There was some indication of a seasonal effect on forage yields. The greatest amount of palatable forage was produced by cutting every 8 weeks, and the most protein in the palatable portion was produced by grass cut at 6 and 8 weeks of age. The percentages of palatable forage and of protein and ash (including phosphorus and calcium) decreased as the plants grew older, while crude fiber percentage increased as the interval between cuttings was prolonged. Grass cut every 6 weeks was handicapped by poor recovery after each harvest, depleted stand, and greater weed competition. When yield, quality, and persistence are all considered, it appears desirable under Hawaiian conditions to cut Napier grass every 8 weeks. A 10-week cutting interval might be used to advantage during winter months when growth is slower.

**The ryegrasses,** H. A. SCHOTH and M. A. HEIN. (Coop. Oreg. Expt. Sta.). (*U. S. Dept. Agr. Leaflet 196 (1940), pp. 8, figs. 2*).—The characteristics, merits, and uses of the Italian (*Lolium multiflorum*), perennial (*L. perenne*), and common ryegrasses are described briefly, with information on climatic and soil adaptations, seeding practices, management for hay and pasture, use as lawn grasses, and seed production.

**The relationship between leaf area and yield of the field bean, with a statistical study of methods for determining leaf area,** J. F. DAVIS. (Mich.

Expt. Sta.). (*Jour. Amer. Soc. Agron.*, *32* (*1940*), *No. 5*, *pp. 323–329*, *fig. 1*).—Field bean leaf areas measured with a planimeter closely approximated those estimated from use of factors obtained from length and width measurements of the center leaflets. Total leaf area=0.004517 $L \times W$ (of center leaflet) was deemed the best of 4 equations because of time saved, since only the length and width of the center leaflet are needed. Furthermore, the leaf area of a field bean plant could be obtained without removing the leaves. Measurements of 36 leaves sufficed to arrive at a suitable factor. This method of securing leaf areas might also be used with any plant with similar leaf habits, providing a suitable factor was calculated. Plants from fertilized plats tended to have greater leaf area and higher yields than plants from untreated plats.

**Preliminary results on seed setting in red clover strains,** C. P. Wilsie and N. W. Gilbert. (Iowa Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron.*, *32* (*1940*), *No. 3*, *pp. 231–234*).—Studies, 1938–39, indicated both less honeybee activity and less seed production in the Zofka short corolla tube strain of red clover than in American strains. Contrary to popular expectation, length of corolla tube did not seem to be important under the conditions. Possibly abundance of pollen, or secretion, or concentration of nectar may have been more important in determining attractiveness of strains to honeybees. Data on seed setting suggested that with well-adapted American strains there might be excellent potential possibilities for high yields of seed when conditions favor abundant bee activity.

**Effect of pollination upon chemical composition of silks of certain inbred lines of maize,** I. R. Hoener and R. O. Snelling. (Ill. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron.*, *32* (*1940*), *No. 3*, *pp. 213–215*).—Pollinated silks (sampled about 72 hr. after emergence) of four inbred lines of corn appeared to be significantly higher in protein content and significantly lower in moisture content than unpollinated silks. The protein content of the silks of the inbred line L317 (Iowa) was considerably higher than that of K4 (Kansas), Ohio 51, and U. S. 540. The H-ion concentration of the juice expressed from silks of K4 and L317 was not influenced by pollination, that of inbred 51 showed an increase of 0.12 pH, and that of inbred 540 a decrease of 0.43 pH. Pollination did not appear to influence significantly the refractive index of expressed juice.

**Corn varieties in Mississippi,** C. R. Owen (*Mississippi Sta. Bul. 339* (*1940*), *pp. 20*, *figs. 10*).—Variety tests with corn at the station and substations, 1928–38, are summarized, effects of early and late plantings on yields are compared, and remarks are made on regional adaptation and characteristics of varieties and on the merits of hybrid corn.

Neal Paymaster, Jellicorse, Cocke Prolific, and College Hybrid 47 (Cocke Prolific × Laguna) were generally outstanding, although rankings varied among stations. Other good sorts were Laguna and the two prolifics Mosby and Hastings. Early plantings, about April 1, have yielded better than late planting, about June 1. Even Laguna, the leader of the late planted group, averaged higher in the early planting.

**Effect of "clipping" or rubbing the oat grain on the weight and viability of the seed,** G. H. Cutler. (Ind. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, *32* (*1940*), *No. 3*, *pp. 167–175*, *figs. 2*).—When grain of six varieties of oats was lightly and heavily rubbed to remove tips or tails of the hull and other extraneous materials, the increase in test weight averaged from 21.8 to 37.4 percent, or 7.3 to 10.2 lb. per bushel, the higher percentages occurring in the lighter samples. Germination tests in a Minnesota germinator and in soil in the greenhouse showed no indication of loss in viability traceable to rubbing or clipping. Results were consistent in all samples stored for from 4 mo. to more than 3 yr.

**Maintaining identity and pure seed of southern oat varieties, T. R. Stanton** (*U. S. Dept. Agr. Cir. 562 (1940), pp. 20, figs. 15*).—Maintenance of varietal identity and purity in southern red oats, long a perplexing problem, has been complicated further by the distribution of improved strains of the relatively few established varieties. Fulghum and Red Rustproof, old and widely distributed varieties, are still being mislabeled. Development of new varieties resembling certain old sorts in plant and grain characters has also led to confusion. Columbia, a new spring variety, is being sold as Winter Turf, and Fulgrain, a new smut-resistant variety, is being confused with Fulghum. Characters useful for differentiating these varieties are described and compared for those interested in identification. Comment is also made on efforts by State seed laboratories and crop improvement associations in making available better seed, true to variety of known breeding.

**Potato research at Cornell University, O. Smith.** (Cornell Univ.). (*Amer. Potato Jour., 17 (1940), No. 2, pp. 27–37*).—Research activities mentioned deal with potato rotations, fertilizers and side dressings, rate of applying potash, seed spacing and rate of fertilizer application, soil reaction and green manure, seed storage and handling methods, storage of table stock, control of dormancy, flowering response to environmental changes and chemical treatment, hollow heart, and cooking quality.

**Potato culture and storage investigations in 1938 and 1939, E. V. Hardenburg.** (Cornell Univ.). (*Amer. Potato Jour., 17 (1940), No. 3, pp. 60–65*).—The review covers 23 titles.

**Performance of clonal strains of Triumph potatoes, I–V, H. O. Werner.** (Nebr. Expt. Sta. et al.). (*Amer. Potato Jour., 17 (1940), Nos. 3, pp. 66–80; 4, pp. 95–99; 5, pp. 123–127;* [6], *pp. 153–155; 7, pp. 174–181*).—Extensive field tests of five or more clonal strains of Triumph potatoes, ranging from very early to very late in maturity, conducted during the last decade in different potato-growing sections of Nebraska and in cooperation with experiment stations in several Southern and Central States, are reported in contributions entitled I, Triumph Strains on Dry Land in Western Nebraska, II, Comparison of Strains Under Irrigation Conditions in Western Nebraska, III, Comparison of Strains in Central Nebraska (at North Platte) With and Without Irrigation, IV, Comparison of Triumph Strains in Eastern Nebraska (at Lincoln) With and Without Irrigation, and V, Comparison of Triumph Strains in Various Southern States.

Where potatoes are grown as a late crop on dry land, the late strains appeared to produce the highest yields in most years and seemed less likely to produce scabby tubers. They produced, however, somewhat rougher tubers and were least productive in dry years. The earliest strains lacked in productivity in the best years and the tubers were quite scabby. Midseason strains appeared to be most desirable because they were reasonably satisfactory each year. Under irrigation in western Nebraska, the earliest strain was desirable if planted early or very late, but seemed hazardous for midseason planting because of the possibility of much scab infection. If this strain is used, plants should be spaced close together. The medium strain appeared most generally suitable. The later strains appeared to have the least scab even if planted early, but the large vine growth, large tuber size, and inferior tuber type render them of doubtful merit. In eastern and central Nebraska with or without irrigation, only the earliest strain could be considered desirable, and it seldom equaled the other early varieties, as Warba or Irish Cobbler.

In the Southern States, yields were slightly higher from the late strains, but the earlier strains, because of somewhat superior tuber type, were often most desirable. The very early strains did not seem so suitable as the second early

or midseason strains for general use in the South. Strain differences, as in time of tuberization, etc., were very much less than in the North.

**Relation of some growth characters to stoloniferous condition in seedling Irish potatoes, J. C. Miller, F. McGoldrich, and E. L. LeClerg.** (La. Expt. Sta. and U. S. D. A.). (*Amer. Potato Jour., 17 (1940), No. [6], pp. 140–147, fig. 1*).—Study of a number of progenies from potato selfings and crosses under field conditions at Baton Rouge, La., revealed that as degree of maturity increased from early to late, tuberization decreased accordingly. The degree of tuberization, in general, decreased as the maximum plant height and as primary stolon length increased. In the crosses studied, heat sprouting increased as stolon development progressed from a tuberous to a less tuberous condition. Maximum heat sprouting occurred at a higher level of tuberization in the two selfings than that for the crosses.

To obtain high-yielding clonal lines of potatoes, it seemed desirable under Louisiana conditions to select first-year seedling segregates having tuberous to slightly stoloniferous types of stolon growth. Since the studies indicate that maximum plant height and earliness of maturity are associated closely to these types of stolon development, these two characters may serve as criteria.

**Longevity of potato seed, C. F. Clark.** (U. S. D. A.). (*Amer. Potato Jour., 17 (1940), No. [6], pp. 147–152, fig. 1*).—Potato seeds stored for 13 yr. in an envelope and in a bottle at room temperatures and in bottles at 40° and 32° F. were tested yearly. Cold storage was decidedly superior to storage at room temperature in maintaining viability, and the envelope was the least efficient. Seed stored at 40° showed no decline in viability after 11 yr. of storage. The 32°-storage prolonged the life of the seed to the end of 13 yr. and appeared to have a stimulating effect, since the highest germination percentages in this lot were obtained during the last 5 yr. of the test.

**Potato quality.—I, Relation of fertilizers and rotation systems to specific gravity and cooking quality, O. Smith and L. B. Nash.** (Cornell Univ.). (*Amer. Potato Jour., 17 (1940), No. 7, pp. 163–169*).—Specific gravity measurement, as determined in sodium chloride solutions, is considered a practical cheap method of separating the mealy from less mealy or soggy potatoes on a commercial scale. Tubers of lower specific gravity and less mealiness were produced by applications of 1,500 lb. per acre of 5–10–5 fertilizer than from lower rates of application, and by 1,000 lb. of this fertilizer on Smooth Rural tubers and 1,333 lb. on Green Mountain than of fertilizer carrying less potash. The 1,000-lb. rates of 5–10–5 fertilizer plus the quantity of nitrogen, phosphorus, and potassium in a 12-ton-per-acre application of manure also resulted in tubers of lower specific gravity and much less mealy texture than those produced with lighter applications. Soils of pH 6.36 produced tubers of lower specific gravity and less mealy texture than soils of higher and lower pH. The tubers grown in soils of pH 7.88 were highest in these respects.

Of 10 rotation systems, the most mealy tubers of the Green Mountain variety with the highest specific gravity were grown on plats where potatoes are grown every year and receive no fertilizer or cover crop. Lowest specific gravity and least mealy tubers were obtained following soybeans harvested for hay.

**Potato quality.—II, Relation of mineral nutrition and alterations in light intensity to cooking quality, L. B. Nash and O. Smith.** (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 861–865*).—Continuing the above, efforts were made to duplicate and accentuate for experimental purposes the alterations in sunlight normally occurring at Ithaca, N. Y., in late August and September. Periodic shading in every fertilizer treatment decreased the specific gravity, dry weight, and mealiness, and in plats receiving nitrogen

increased the incidence of blackening. Partial composition of tubers from various treatments and results of cooking tests are discussed briefly. Differences in the amount of sunlight and alterations therein during the tuber formation period may provide some explanation of differences in quality of potatoes grown in different regions and years.

**Cooking quality of the potato as measured by specific gravity,** C. F. Clark, P. M. Lombard, and E. F. Whiteman. (U. S. D. A.). (*Amer. Potato Jour., 17 (1940), No. 2, pp. 38–45, fig. 1*).—While the two methods of measuring specific gravity used in tests on 12 varieties of potatoes grown at Aroostook Farm, Maine, gave about the same results, the salt solution method is more rapid and preferred to the method of weighing in air and water. Use of salt solutions of known densities was found practical for making preliminary selections for mealiness. Studies of large populations could be facilitated greatly by this method, since it required much less time than the usual cooking method, and the material tested might be used later for planting. The highly significant interaction between seasons and mealiness indicated that a single season's test is not an adequate basis for rating the mealiness of a variety.

**Sorghum production in Nebraska,** R. L. Cushing, T. A. Kiesselbach, and O. J. Webster (*Nebraska Sta. Bul. 329 (1940), pp. 58, figs. 26*).—Sorghum, recently of special interest in Nebraska as a relatively dependable crop to meet conditions of prolonged drought, has increased in acreage harvested from 135,000 acres in 1929 to 1,324,000 in 1939. About 60 percent of the crop is used as forage and most of the remainder as grain. Information on varieties and their adaptation, cultural and field practices, and harvesting and storage methods for producing sorghum for grain and forage is set forth, with discussion of diseases and insects and their control. The recommendations are based largely on research by the station and stations in nearby States.

The superiority of Early Kalo, Sooner, Kalo, and Day for grain production has been demonstrated by yield tests at Lincoln and North Platte and on farms throughout the State. Under conditions of chinch bug infestation, Club and Western Blackhull kafir are considered more suitable in southeastern Nebraska. Atlas, Leoti, Kansas Orange, Early Sumac, and Black Amber have produced highest yields of forage. The 23 varieties currently of greatest importance in the State are described. As an average for several years, Early Kalo and other adapted varieties have yielded more than twice as much grain as corn, and, in general, superior sorgos have given forage yields double those from corn.

Cultural suggestions include early and thorough tillage and planting about 10 to 14 days later than the normal time for planting corn, i. e., in late May and early June in most of Nebraska. For grain production it usually is advisable to have stands too thin rather than too thick. More and better forage usually is obtained from closer spacings, either in rows or drilled. Plants in 40- or 42-in. rows in eastern Nebraska should be spaced for grain from 6 to 10 in. and for forage from 2 to 4 in., and in central and western Nebraska for grain from 8 to 12 in. and for forage from 4 to 6 in. Drilled for hay, about 100 lb. per acre of seed should be sown in eastern Nebraska and 75 lb. further west. The seed should generally be covered with from 1 to 1.5 in. of soil firmly packed. Sorghum may be grown successfully under irrigation and has particular merit where water is abundant only in the fall and spring. Later-maturing varieties and closer plant spacings may be used under irrigation than on dry land at the same location.

**Methods and rates of planting soybeans,** C. K. McClelland (*Arkansas Sta. Bul. 390 (1940), pp. 18, fig. 1*).—Planting experiments, 1925–36, comprised seed-

ings of Laredo soybeans at rates of from 7 to 56 lb. (7-lb. increments in 36-in. rows and from 20 to 90 lb. (10-lb. increments) in 8-in. drills and broadcast, and of Mammoth Yellow from 14 to 63 lb. in rows and from 30 to 117.5 lb. (12.5-lb. increments) under the other methods. The respective average yields from the rows were for Laredo seed 11.7 bu., hay 1.91 tons, and Mammoth Yellow 10.44 and 1.8, drills 6.38, 1.41, and 5.7, 1.03, and broadcast 5.42, 1.20, and 4.86 bu., 0.96 ton. The row-cultivation method was superior, especially in droughty seasons. The number and chances of failures were much greater from the drill and broadcast methods.

Under row cultivation, the 49-lb. rate for Mammoth Yellow produced the highest seed yield and the second highest yield of hay, yet increases over the lower rates, except over 14 lb., in seed production were not significant. Hay yields from the 21-lb. rate were equally satisfactory, but higher rates produced a finer-stemmed hay. The 14-lb. rate of seeding Laredo soybeans returned the highest seed yields and within 0.05 ton as much hay as any higher rate. Yield variations due to seasonal conditions were much more marked than those due to varying seeding rates.

When drilled, Mammoth Yellow seed yields were reduced nearly one-half. The optimum acre rate for hay, 67.5 lb., was slightly less than the average of the three amounts returning highest seed production. With Laredo there were no significant differences among the seeding rates for either seed or hay yields.

Under the broadcast method, more failures resulted and yields of seed and hay of both sorts were lower than under the other two methods. The heavy rates of seeding Mammoth Yellow, from 92.5 to 117.5 lb., produced the higher seed and hay yields, but with Laredo a medium rate, 60 lb., produced the most satisfactory returns for both.

**Electricity in sweet potato plant production**, J. B. Edmond and G. H. Dunkelberg (*South Carolina Sta. Rpt. 1939, pp. 54–60; abs. in Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 855, 856*).—*Experiments on Porto Rico sweetpotato plant* production in electrically heated hotbeds in the spring of 1939 included tests with several types of hotbed covers and of insulating materials, spacing and position of the heating cable, temperatures, and regular v. crowded bedding of roots.

Covers of Sun-Ray cloth, Vito-Mesh, and glass sash varied somewhat in number of plants per root and per bushel but did not differ widely in number of kilowatts of electricity required to produce the same number of plants. Tobacco cloth in two layers was the least satisfactory cover, resulting in fewer plants and using more electricity per unit number of plants. Cinders and soil and double walls filled with glass wool conserved electricity better that did pine straw and soil and soil only. In general, the wider spacing of the heating cable resulted in fewer plants produced per root and per bushel and smaller use of electricity per unit area of bedding space. Soil temperatures usually were from 2° to 3° F. lower and less uniform throughout the bed in the 18- than in the 6- and 12-in. spacings. Roots bedded 1 in. above the heating cable produced more plants per root and per bushel and used slightly less electricity per unit area of bedding space than those bedded on the same level with the cable. The high-temperature bed (78° to 80°) produced more plants per root and per bushel and consumed more electricity per unit area than the low-temperature bed (68° to 70°) but with most profitable returns. Crowded bedding, 300 roots in about 18 sq. ft., gave more plants per unit area but fewer per root and per bushel than regular bedding,

150 roots in an equal area, and also used less electricity to produce unit number of plants.

**The influence of variety, season, and green manures upon the composition of wheats, J. E. Greaves, A. F. Bracken, and C. T. Hirst.** (Utah Expt. Sta.). (*Jour. Nutr., 19 (1940), No. 2, pp. 179–186*).—Spring wheat (7 varieties) grown, 1923, 1929–35, on the Nephi Substation dry farm carried greater percentages of ash, calcium, magnesium, potassium, iron, phosphorus, and sulfur than did winter wheat (17 varieties), both produced on the same deep dry-farm clay loam soil. A significant difference was found in the calcium content of different winter wheats grown on the same soil. A highly significant correlation existed among most of the mineral constituents of wheat. When wheats of different years were compared, a high variation was apparent in the various mineral constituents from year to year. Addition of green manures to a typical dry-farm soil caused a highly significant variation in ash content and a significant difference in calcium and phosphorus. Green manure increased materially the phosphorus content of wheat, probably due to increased bacterial activities which in turn increased available plant food in the soil.

**Report of the Sixth Eastern Wheat Conference** (*U. S. Dept. Agr., Bur. Plant Indus., 1939, pp. [2]+10*).—Papers given at the conference held in Wooster, Ohio, June 16, 1939, included The Federal Soft Wheat Laboratory, by E. G. Bayfield (pp. 1, 2); Breeding for Resistance to Hessian Fly, by W. B. Cartwright (pp. 2, 3) (U. S. D. A.); Inheritance of Quality and Cold Resistance in Wheat and Their Inter-Relationship, by W. W. Worzella and G. H. Cutler (pp. 3, 4) (Purdue Univ.); Disease Resistance in the Soft Winter Wheats, by R. M. Caldwell (pp. 4–9) (Purdue Univ. and U. S. D. A.) (see p. 785); and Scab Resistance in Winter Wheat, by R. G. Shands (p. 9) (Wis. Expt. Sta. and U. S. D. A.)

**[Seed research]** (*Farm Res. [New York State Sta.], 6 (1940), No. 3, p. 9*).—Seed Injury Lowers Germination, by M. T. Munn, describes mechanical injury in certain stocks of soybeans and red kidney beans which lowers germination percentage. The injury may be done by either combine or threshing machine when the crop is very dry at harvest or threshing. In every case, adjustments of speed of the machine and cylinder must be carefully made by the operator for each type of combine used if such injury is to be prevented. When the Seeder-Box "Speaks," by L. E. Everson, describes samples of home-grown seed obtained on 1,000 farms during the active clover planting season. About 39 stocks of each 100 were considered unfit for use as they were. An additional 13 percent were objectionable because of presence of certain weed seeds. Wild carrot was the most prevalent weed seed in red clover and alfalfa seed farmers had grown for their own use, night-flowering catchfly in sweetclover samples, and yellow rocket in mixtures of alsike and timothy. Nearly 86 percent of the seed stocks used had been recleaned, but the mill used apparently was not adequate or properly equipped for satisfactory work. Seed Notes accounts for sudden appearance of a profuse stand of certain weeds, as yellow rocket, the mustards, and cinquefoil, as due to cold and moist season; discusses the appearance of bindweed in stocks of dark-colored soybeans, especially Black Wilson; and mentions the possibility of farmers growing hardwood trees for seed production.

**Summary of bindweed situation and progress of eradication in 1939,** T. F. Yost (*Kans. State Bd. Agr. [Quart.] Rpt., 59 (1940), No. 237, pp. 74, figs. 15*).—This report of the further progress (E. S. R., 82, p. 42) of the program describes eradication activities in 1939, including cultivation and chemicals by farmers, work done by highways, railroads, cities, and State institutions, and also kinds of implements and equipment used; and includes results of coopera-

tive determination of effects of the weed on crop yield and soil moisture, fires and livestock losses due to use of sodium chlorate, and brief reports on other noxious weeds in Kansas.

***Russian thistle silage***, F. T. DONALDSON and K. J. GOERING. (Mont. Expt. Sta.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 3, pp. 190–194*).—Analyses showed Russian-thistles to equal alfalfa in protein and fat content and to surpass it in carbohydrate: crude fiber ratio. The thistles were high in mineral content, with the $K_2O$ exceeding 8 percent. The high content of $P_2O_5$ (0.78 percent) may enhance the feeding value of the thistles in areas known to produce phosphorus-deficient forages. Analyses of silages prepared by ensiling Russian-thistles in ½-gal. jars indicated that good silage could be prepared with the addition of either sugar (3 percent) or $H_3PO_4$ (1 percent) but that poor silage would probably result from untreated thistles.

# HORTICULTURE

**[Horticultural studies conducted by the Massachusetts Station]**, K. J. KUCINSKI, W. S. EISENMENGER, H. M. YEGIAN, L. H. JONES, C. J. GILGUT, W. G. COLBY, E. BENNETT, H. F. BERGMAN, W. E. TRURAN, H. E. WHITE, C. L. THAYER, H. S. TIFFANY, W. H. LACHMAN, R. E. YOUNG, P. W. DEMPSEY, A. P. TUTTLE, J. K. SHAW, L. SOUTHWICK, A. P. FRENCH, O. C. ROBERTS, J. S. BAILEY, R. A. VAN METER, and W. H. THIES. (Partly coop. U. S. D. A. and Conn. and R. I. Expt. Stas.). (*Massachusetts Sta. Bul 369 (1940), pp. 10, 11, 22, 25, 32, 39, 51, 53–55, 69, 70, 76–85, figs. 5*).—Among projects the progress of which is discussed are winter cover crops for onion fields; onion breeding; effect of the type of container on the growth of flowering plants; factors affecting yield of onions and their shrinkage in storage; effect of storage and processing on the carbohydrates of varieties of edible onions; breeding of cranberries resistant to false blossom; flower and fruit production of cranberries; breeding of snapdragons; effect of plant nutrients, soil reaction, and light on the gardenia; forcing tests of hybrid Easter lily seedlings; culture of the freesia; physiological disorders of the carnation; quality of flower seeds retailed in packets; propagation of hybrid lilacs; factors influencing the hardiness of evergreens; shape index in the tomato; sweet corn breeding; testing of hybrid sweet corns; tomato breeding; effect of cultural practices prior to field setting on the yield and quality of peppers; varieties and culture of asparagus; growing of tomatoes on trellises; improvement of lettuce, celery, tomatoes, rutabagas, carrots, peppers, broccoli, beets, beans, etc.; clonal rootstocks for the apple; tree characters of fruit varieties; genetic composition of peaches; cultivation v. sod emulsion for the apple; cultivation v. mulching for the apple; fertilizer needs of the apple; testing of fruit varieties; fruit bud formation in the strawberry; fruit bud mutation in the apple; behavior in storage of apples affected with internal cork; nutrition of the high-bush blueberry; blueberry culture; factors affecting the premature dropping of the McIntosh apple; and methods of sun-coloring harvested apples.

**[Horticultural studies by the Nebraska Station]** (*Nebraska Sta. Rpt. [1939], pp. 23, 24, 25, 26*).—Included are progress statements on investigations of water requirements and irrigation of apple trees, spray materials for apple scab control, rootstocks for the apple, tomato breeding and culture, testing of sweet corn hybrids, and breeding of carrots.

***[Horticultural studies by the New Hampshire Station]***, A. F. YEAGER, L. P. LATIMER, W. W. SMITH, J. R. HEPLER, and H. S. CLAPP (*New Hampshire Sta. Bul. 319 (1940), pp. 37–40*).—Included are brief progress reports on investigations on the fertilization of apple trees, apple spraying, strawberry culture, effect of

boron upon apple drop and upon apple cork spot, propagation and culture of the blueberry, rootstocks for the apple, relation of the time of applying nitrogen to the time of winter injury in the apple, and vegetable breeding.

**Horticulture at the Ohio Agricultural Experiment Station, Wooster, Ohio** (*Ohio Sta. Spec. Cir. 60 (1940), pp. [2]+59, figs. 19*).—Ninth in a series (E. S. R., 80, p. 192) designed to give the reader concise information on the progress of various horticultural investigations conducted by the station, this circular discusses varietal, cultural, breeding, physiological, and other studies with various fruit, vegetable, potato, and flower crops.

**Vapor-heat treatment for fruits and vegetables grown in Hawaii, W. W. Jones** (*Hawaii Sta. Cir. 16 (1940), pp. 8*).—As a result of studies of the tolerance of different fruits and vegetables to heat treatment and of methods of subsequent handling to insure safe shipment to the mainland, practical recommendations are presented for the handling of certain Hawaiian-grown fruits and vegetables which are most likely to be shipped.

**The frozen fruit and vegetable industry, D. K. Tressler** (*Farm Res. [New York State Sta.], 6 (1940), No. 3, p. 15*).—Information is given as to the extent and distribution of the industry, with comments that New York State leads in the production of frozen peas, sweet corn, and Montmorency cherries.

**Asparagus: Its planting, care, and management, L. A. Somers** (*Illinois Sta. Cir. 507 (1940), pp. 36, figs. 12*).—General information is offered on the structure of the asparagus plant, varieties, plant production, selection of sites, planting, cultural care, causes of poor stands, harvesting, marketing, economic outlook, etc.

**Descriptions of types of principal American varieties of red garden beets, R. Magruder, V. R. Boswell, H. A. Jones, J. C. Miller, J. F. Wood, L. R. Hawthorn, M. M. Parker, and H. H. Zimmerley.** (Coop. Calif., La., Tex., and Va. Truck Expt. Stas.). (*U. S. Dept. Agr., Misc. Pub. 374 (1940), pp. 60, pls. 30*).—Sixth in the series (E. S. R., 83, p. 627), this deals with distinguishing characteristics of the principal commercial varieties of red garden beets. Special consideration is given to the effect of environmental factors, such as season, temperature, soil acidity, soil fertility, etc., on the vigor of growth, shape, color and quality of roots, and other characteristics.

**Effects of controlled calcium supply on carrots grown in colloidal clay cultures, A. W. Purdy.** (Mo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 799–802*).—That Ca is of primary importance in the nutrition of carrots was indicated by experiments in which plants were grown in a colloidal clay culture and at a uniform pH and constant level of all nutrients except Ca. Plants without Ca lived for only 6 weeks and developed only one tiny true leaf. Successively better growth was made as the Ca increased from 2 to 6 milligram equivalents per plant. Beyond 6 m. e., there was no added increment in total growth. The highest percentage of P in the roots and leaves occurred in the 6-m. e. lot. The leaves were particularly responsive to changes in the Ca supply. With every increase in Ca there was a marked increase in Ca per unit weight of tops produced. Results suggest the practical value of liming soils low in Ca and the relative ineffectiveness of excess applications.

**Handling and shipping lettuce in New York, H. Platenius** (*[New York] Cornell Sta. Bul. 732 (1940), pp. 24, figs. 7*).—The increase in the production of iceberg types of lettuce in New York State was found to be leading toward improved practices in the packaging and handling of the product. Compactness of the head and freedom from defects were found of major importance in determining the price of lettuce. Observing that New York grown lettuce has been trimmed less closely than California lettuce, the author suggests greater

attention to this detail. From a study of temperature records and observations on the appearance of lettuce at the market it is concluded that there is no significant difference between the condition of lettuce shipped by rail or by truck.

The beneficial effects of precooling have been overrated because precooling is a slow process and the lowered temperature does not continue long after removal from storage. No other handling method was equal to package-icing in effectiveness. In this treatment the temperature of the lettuce drops to less than 40° F. in 12 hr., with the result that the iced lettuce is always better than that shipped directly from the field. However, the Boston variety cannot be satisfactorily package-iced, leaving precooling as the only practical means of handling this type. The rate of reheating of iced packages was found to be slow, permitting the product to continue in good condition for some time after the lettuce reaches the markets. Package-iced New York grown lettuce of the iceberg type sold on a favorable basis with the California product. Practical suggestions are presented.

**The effect of cultivation on the yield of onions on peat soil,** R. D. SWEET. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 807–810*).—In cooperative investigations on growers' farms in the Genessee-Orleans peat area of New York it was observed that in four of seven comparisons of deep with shallow cultivation the deep tillage reduced the total yields and in no case increased yields. In the three negative comparisons it is believed that the effects of late planting, weed growth, or mineral deficiencies may have conflicted with tillage results.

**The response of onions to manganese on unproductive peat soils,** J. E. KNOTT. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 803–806, fig. 1*).—In 1937, a year of above-normal rainfall, comparisons of Mn with other minor elements in experiments in various peat areas of New York where the pH range was from 4.4 to 7.3 failed to show any benefit from the use of 50 lb. per acre of $MnSO_4$ or any of the other materials. On June 2, 1939, $MnSO_4$ and borax were applied as aqueous solutions at the rate of 100 lb. per acre of each to onions which had a yellow color and were dying at the tips. Within a week the plants receiving $MnSO_4$ alone or with borax became green and resumed vigorous growth. Similarly favorable results were secured on other unproductive areas. Since the addition of borax to $MnSO_4$ had little benefit, the author suggests that borax is not a factor in increasing growth. By far the most serious condition is that in which shallow peat is underlaid with marl. It is suggested that the use of $MnSO_4$ should be more economical than incorporating large amounts of S, and that under dry weather conditions aqueous solutions will give quick results.

**Fertilizer experiments with tomatoes, 1919–39,** W. B. MACK, G. J. STOUT, and E. M. RAHN (*Pennsylvania Sta. Bul. 393 (1940), pp. [2]+28*).—Of 30 different manurial treatments carried on over a period of years, those associated with the greatest mean yields of total fruit and of marketable fruit were as follows: "Rotted barnyard manure; complete fertilizer containing half the standard amount of nitrate of soda (supplying 30 lb. N to the acre) and the standard amounts of superphosphate and muriate of potash (supplying 100 lb. $P_2O_5$ and 80 lb. $K_2O$ to the acre, respectively) broadcast before planting, together with a side dressing of nitrate of soda supplying 30 lb. N to the acre at the time of blossom set; complete fertilizer containing 50 percent more than the standard amount of superphosphate (supplying 150 lb. $P_2O_5$ to the acre), in combination with the standard amounts of nitrate of soda and muriate of potash (supplying 60 lb. N and 80 lb. $K_2O$ to the acre, respectively); complete fertilizer containing the standard amounts of nitrate of soda and superphosphate and half

the standard amount of muriate of potash; twice the standard complete fertilizer with 10 tons of rotted manure to the acre. Calcium nitrate and cyanamide were not significantly different from nitrate of soda, in combination with superphosphate and muriate of potash, in their influence on yields. Ammonium sulfate, tankage, and dried blood, each in similar combination, however, were less favorable than the other three carriers just mentioned. Marketable yields were very highly correlated with total yields. The only significant differences among mean early yields were those between each of the standard carriers applied alone, and any combination of each, respectively, with one or more of the other carriers, except between superphosphate and the combination of superphosphate and muriate of potash. Early yields from single-element carriers were less than from combinations of two or more carriers.

"In an experiment conducted for 1 yr. only, differences among mean yields associated with different placements of fertilizers were insignificant. There is some evidence that dilute phosphoric acid or superphosphate solutions applied to the roots at transplanting increased the early yield of tomatoes in comparison with water alone, similarly applied. Solutions of nitrogen or potash-containing compounds, however, were not consistently favorable to yields when applied in the same manner."

**The ripening and repacking of mature-green tomatoes,** R. C. Wright and E. A. Gorman, Jr. (*U. S. Dept. Agr. Cir. 566 (1940), pp. 8, fig. 1*).—Stating that the ripening and repacking of green-picked tomatoes from the Southern States has become a specialized business in several of the large cities, the authors describe the methods employed in ripening, the necessary equipment, the ethylene treatment, etc. Ultimate quality depended on proper maturity when the fruits were harvested, that is, the fruit should be in the mature-green stage when removed from the vines. Poor quality, frequently observed during the winter season, is due largely to picking of the fruits when too immature. Under average market conditions, tomatoes are usually ripened at about 68° F., 4 or 5 days being required for mature-green tomatoes, and 2 days for turning tomatoes. If the maximum quality in flavor and color is desired, a temperature close to 60° is recommended. At this temperature the finished product will be firmer, will keep longer, and will develop less decay than if ripened at higher temperatures, but the time requirement will be considerably longer. With a very active market, temperatures of from 70° to 72° may be used to give maximum speed in ripening.

**Fruit setting of watermelons,** C. R. Cunningham. (Mo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 811–814, fig. 1*).—To determine the relationship of leaf area to fruit set, certain plants were defoliated partially when they reached the fruit-setting stage. Of the three types of defoliation, (1) every other leaf, (2) every third leaf, and (3) two of every three leaves, the greatest inhibition to fruit setting came with the severest treatment. When $NaNO_3$ was applied as a side dressing, it appeared to reduce fruit setting by delaying and decreasing the fruit set. The setting of watermelon fruits tended to check terminal growth of that particular vine and to interfere with the development of fruits setting subsequently.

**New hardy fruits for the Northwest,** N. E. Hansen (*South Dakota Sta. Bul. 339 (1940), pp. 31, figs. 15*).—Included is information as to the origin, principal characters, and uses of a large number of hardy fruits—apples, crabapples, pears, plums, cherries, and currants—originated and introduced by the station during the period 1927–40. Appended is a complete alphabetical index of all the station's horticultural introductions.

**The morphology of the apple and other pome fruits,** L. H. MacDaniels (*[New York] Cornell Sta. Mem. 230 (1940), pp. 32, figs. 16*).—The author pre-

sents "a review of the evidence on the interpretation of the morphology of the pome flower as largely receptacular or largely appendicular in nature, and a critical study of a number of pomaceous and other rosaceous genera, [which] support the conclusion that the pome flower is appendicular in its derivation and structure. The appendicular interpretation is consistent with the comparative anatomy of the whole range of families, and with the nature of the inferior ovary generally. Phylogenetically the pome flower has arisen from the fusion, by adnation, of the fleshy rosaceous floral tube with the compound ovary. The floral tube, composed of the fused bases of the stamens, petals, and sepals, enlarges greatly as the fruit matures, and forms the larger part of the pome fruit. The so-called 'core line' of the apple is interpreted as representing the line of fusion between the floral tube and the ovary. According to the appendicular interpretation, the fruits of the apple, the pear, and the quince are described as fleshy accessory fruits, made up of a five-carpeled ovary, with cartilaginous endocarp and fleshy exocarp, united with a fleshy floral tube or disk consisting of the fused bases of the sepals, petals, and stamens. Variation in pome structure is chiefly in the following characters: In the number of carpels, which may vary from two to five; in the nature of the endocarp, which may range from bony in *Crataegus* and some other genera to cartilaginous; and in the degree of completeness with which the ovary is covered by the fleshy floral tube."

**New rootstocks for apples on trial, H. B. Tukey** (*Farm Res. [New York State Sta.], 6 (1940), No. 3, pp. 8, 15, fig. 1*).—Indicating the interest in apple rootstocks that will produce smaller than standard trees, the author discusses other potentially valuable characters of rootstocks, such as tolerance to unfavorable soil moisture conditions, and classifies the Malling group as to moisture tolerance. Malling VII, I, and XIII proved adaptable to a wide range of soil moisture conditions. Malling IV, XII, and II were intolerant to low moisture, and others occupied intermediate places.

**What new apple varieties are doing: A survey of growers, R. Wellington and H. O. Bennett** (*Farm Res. [New York State Sta.], 6 (1940), No. 3, pp. 3, 12*).—This second paper in the series (E. S. R., 82, p. 774), based on analyses of growers' replies to questionnaires, presents information as to the performance of a number of McIntosh seedlings, namely, Early McIntosh, Milton, Cortland, Macoun, and Kendall.

**Experiments in orchard soil management: Fertilizers, mulches, and cover crops, R. C. Collison** (*New York State Sta. Bul. 691 (1940), pp. 37*).—In studies on subsurface placement of manure and fertilizers in a McIntosh orchard, data taken over a 3-yr. period indicated no better response to any method of deep placement employed than to the usual surface applications. The results suggested that the greater expense of placing fertilizers in the root zone, at least as based on the results of this particular experiment, is unjustified.

Studies of N fertilization in a well-mulched McIntosh orchard located on medium-light soil indicated that applications normally recommended for unmulched orchards may be too large for use with a heavy mulch of nonlegume material. Excessive N may result in a serious reduction in color of the fruit and an increase in dropping during the preharvest period. The differential response of apple varieties to fertilizer treatment is considered of sufficient significance to warrant more detailed study. For example, it was found that Delicious has appreciably more Ca in its leaves than did Baldwin, McIntosh, or Northern Spy and that this fact may be related to the apparent susceptibility of Delicious to acid soil conditions. Northern Spy took up the least Ca of the 4 varieties and was the least resistant to adverse nutrient conditions. Some 15 different cover crops available for temporary or permanent orchard covers

were compared from as many angles as possible, with stress on seeding, persistence, dry matter production, weed competition, self-seeding, type of cover produced, water relations, and snow retention.

**Very dilute a-naphthalene acetic acid spray and fruit drop, M. McCown and C. L. Burkholder.** (Ind. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 429-431*).—Application on September 19, 1939, of 0.0001 percent α-naphthaleneacetic acid to halves of 18-year-old Delicious trees and on September 28 to Golden Delicious, Stayman Winesap, and Rome Beauty trees had no material influence on fruit dropping, as compared with unsprayed portions of the trees. In one case, where some difference was noted, high-temperature injury to the fruit in mid-September was a disturbing factor tending to invalidate results. The authors point out, however, that only one season's results are included.

**Further observations on the pollination of the highbush blueberry, T. A. Merrill and S. Johnston.** (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 617-619, figs. 2*).—Employing four technics, (1) flowers not emasculated but hand pollinated, (2) flowers emasculated and hand pollinated, (3) flowers brushed but not emasculated, and (4) open-pollinated, the authors report that the percentage of set secured from self-pollination was not significantly different from that under open-pollination. A slightly lower percentage of set of emasculated blooms is attributed to either mechanical injury during stamen removal or to lack of receptivity due to the immaturity of the pistils of some of the unopened flowers. The percentage of set when blossoms were brushed was lower than when open-pollination was used in all varieties except Concord. Berries from self-pollination matured normally and were as large as, if not slightly larger than, open-pollinated berries of the same variety.

**Sees new interest in blueberries, R. C. Collison** (*Farm Res. [New York State Sta.], 6 (1940), No. 3, pp. 2, 12*).—General information is presented on the rapid development in the growing of named varieties of blueberries under systematic cultural methods. See also Circular 189 (E. S. R., 83, p. 340).

**Effect of spacing plants on yield of strawberries, H. J. Sefick** (*N. J. State Hort. Soc. News, 21 (1940), No. 5, p. 1247*).—Fairfax strawberry plants, set from 18 to 20 in. apart in 4-ft. rows, were spaced during the summer so that the runners stood from 7 to 9 in. apart. At the end of the growing season there was an average of 2.88 and 4.36 plants per square foot in the spaced and matted rows, respectively. In the spring fruiting season the spaced plants produced 8,024 and the unspaced 6,676 qt. of berries per acre. The average size of berries was consistently larger in the spaced plats. The proper spacing distance was found to vary with varieties, depending on the length of the runners.

**Grape production in Texas, E. Mortensen and U. A. Randolph** (*Texas Sta. Cir. 89 (1940), pp. 26, figs. 10*).—Among subjects discussed are the status of the industry, soils and sites, propagation, rootstocks, varieties and their uses, planting, pruning, culture, control of insect and disease pests, harvesting, etc.

**Grape progenies of self-pollinated vinifera varieties, E. Snyder and F. N. Harmon.** (*U. S. D. A.*). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 625, 626, fig. 1*).—Observations on progeny vines from self-pollination of vinifera varieties showed, in general, a striking resemblance in growth vigor and foliage characters to the parents. There was no general indication of loss of vigor in the seedlings. Despite the fact that all vinifera parents had upright stamens, there was an average of 13.1 percent of seedlings with reflex stamens. White-fruited parents produced all white-fruited seedlings. Red-fruited parents produced white and red seedlings, with an occasional black. Black-fruited parents produced mostly white and dark red. Petit Syrah produced only black seedlings. There

was sufficient variation in time of ripening in certain progenies to permit the selection of earlier-ripening varieties.

**"Synthetic" Zante currant grapes: Breeding investigations indicate possible origin, and point way toward production of new varieties,** E. SNYDER and F. N. HARMON. (U. S. D. A.). (*Jour. Hered., 31 (1940), No. 7, pp. 315–318, figs. 3*).—An account is presented of the origin by chance mutation of a currant-type seedless grape on a 27-year-old Muscat of Alexandria vine near Fresno, Calif., and also of the development by breeding of currant-type seedless grapes. In breeding, parthenocarpic seedless types appeared more frequently in the $F_2$ than in the $F_1$ population.

**Preliminary observations on the refrigerated gas storage of Gros Michel bananas,** C. W. WARDLAW (*Trop. Agr. [Trinidad], 17 (1940), No. 6, pp. 103–105*).—In the case of "heavy ¾-full" fruits rapidly cooled to 53° F. and held there for 20 days, gas mixtures containing 5 percent $CO_2$ and from 7 to 12 percent $O_2$ notably retarded ripening without injurious effects. The best results were secured at the lower $O_2$ percentage. The gas-ripened fruit assumed a good yellow color and quality and showed no evidence of chilling. Under conditions of rapid cooling from tropical temperatures to 53° with $CO_2$ accumulation and $O_2$ depletion in closed containers, the respiration rate fell off rapidly from an initial value of from 35 to 40 mg. kg. hr. to from 8 to 10 mg. kg. hr. An increase in the concentration of $CO_2$ observed in tissues under high $CO_2$ conditions was soon lost on return of the bananas to open air. A rise in $CO_2$ and a decrease in $O_2$ occurred under conditions of restricted ventilation, but there was difficulty in lowering the $O_2$ sufficiently. Mature fruits were found unsuitable for refrigerated gas storage, as is the case with ordinary storage.

**Stigma receptivity and pollen shedding in some pecan varieties,** C. L. SMITH and L. D. ROMBERG. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 8, pp. 551–564, figs. 6*).—Determinations during from 1 to 3 seasons of the receptive period of the stigmas of 16 varieties of pecan showed wide variation under Texas conditions in the length of receptive periods of different varieties in a single season and the same variety in different seasons. The variations in the lengths of the periods in the same variety are ascribed to variations in time of initiation of shoot growth and to seasonal variations. The pollen-shedding periods varied in the same way as the stigma-receptivity periods. In 12 varieties studied, all unpollinated nuts dropped in from 5.5 to 6.5 weeks after the last date of stigma receptivity. The degree of dichogamy varied widely in different varieties, with the result that in some a relatively good set of nuts was obtained from self-pollination while in others little or no self-pollination was evident. All varieties studied fall into two groups with reference to the relative time of pollen shedding and stigma receptivity. In one group (protandrous), pollen shedding occurred relatively early and stigma receptivity relatively late; and in the other group (protogynous), the relative time of flower maturity was reversed. However, the actual time at which the flowers of any tree of variety mature, as compared with another, is also dependent upon the time of growth initiation and rates of shoot and flower development. Adequate pollination in a pecan orchard may be attained by interplanting protandrous and protogynous varieties.

**Gravel and cinder culture of greenhouse flowering crops,** A. LAURIE and D. C. KIPLINGER (*Ohio Sta. Bimo. Bul. 204 (1940), pp. 98–108, figs. 5*).—"The subirrigation method of growing plants in an inert medium is gradually assuming commercial importance. Overoptimistic suggestions for the immediate success of this method are to be condemned, as much remains to be done before large-scale installations should be made. Enough has been accomplished, however, to present some facts on the method."

Diagrammatic drawings and some general directions for the construction of concrete benches, conversion of wooden benches, construction of solution tanks, arrangement of piping, valves, spreading troughs, pumps, and other details of the mechanical set-up are presented. For waterproofing, asphalt emulsions and paints were satisfactory, but tar showed itself toxic to the plants. Galvanized piping should be avoided because of possible damage from the zinc. Eaves trough used as a spreading trough is to be asphalt coated to prevent zinc injury. It is pointed out that sump pumps are easier to put in than pumps of the side-suction centrifugal type and do not require a separate compartment in the tank to keep the matter dry. The pumping equipment should be such that benches can be pumped in 30 min. and drained in 60 min. Clock control of the pumping system is recommended as insuring regular pumping.

Cinders, if used as the solid growth medium, must be leached before use. They may have too high a water-holding capacity; may contain excess boron (though this may be rendered harmless by adding 10 cc. of commercial sodium silicate solution to each 100 gal. of culture solution); may be so alkaline as to precipitate iron, manganese, and phosphates; and they may disintegrate too readily. Gravel, if calcareous, may require broadcasting of monocalcium phosphate, 5 lb. per 100 sq. ft., followed by thorough watering, to prevent too high a pH value and precipitation of iron, manganese, and phosphates. A commercial material called Haydite has thus far proved satisfactory and to cost no more than properly prepared cinders. Other materials, such as trap rock and granite chips, may be found to be equally suitable.

Directions for the preparation of a culture solution are given. The solution recommended supplies potassium, magnesium, calcium, iron, manganese, both ammonium and nitrate nitrogen, phosphate, and sulfate. Impurities in the commercial chemicals used are depended upon to furnish the trace-requirement elements not added as such. Adding compounds of boron, zinc, copper, etc., may cause injury through excess. The solution may be changed every month, but the authors used the same solution for 2 mo. without harmful effects. Testing of solutions for nutrient content, frequency of pumping, planting, and pest control are also discussed.

***Studies on the effects of additions of trace elements to the greenhouse rose***, A. Laurie and J. R. Culbert. (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 945–950*).—Using a relatively inert medium (C media haydite), a combination of burned shale and clay, budded Better Times rose plants were supplied with a nutrient solution plus minute quantities of B, Zn, Cu, and ammonium sulfate. It was found that small amounts of B or Zn in concentrations below toxicity stimulated the flowering of the rose. Cu applications decreased total production and caused greater percentages of short-stemmed blooms. Apparently some ammonium was necessary for optimum rose production, particularly during periods of high carbohydrate production in the spring and fall.

**The effect of different soil media on the production of flowers of Better Times roses**, E. I. Wilde. (Pa. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 942–944*).—Four soil media were used in greenhouse studies, viz, ⅔ sand and ⅓ manure; ⅓ sand, ⅓ Hagerstown silty clay, and ⅓ manure; ⅔ Hagerstown silty clay and ⅓ manure; and ⅔ Morrison silt loam and ⅓ manure. Plants in media containing sand produced more flowers than those in clay or loam. The 3-yr. average annual production per plat of 40 plants was 863.3, 873.3, 829.1, and 823.5 flowers, respectively. A difference of 26.5 was significant.

***Fertilization of woody ornamental plants***, L. C. Chadwick (*Ohio Sta. Bimo. Bul. 204 (1940), pp. 89–96*).—In connection with general information on the

fertilization of woody plants, data are presented on the root distribution of Moline elms as influenced by fertilizer treatments. The use of highly concentrated fertilizers resulted in a deeper and less extended root system than was the case with less concentrated materials. In the light of observations, suggestions are given for the effective placement of fertilizers by the hole method. Based on trunk increments, fall applications of fertilizer were generally found equal to or better than spring applications. In general, complete fertilizers gave better results than incomplete, with definite evidence in favor of N and P. A fertilizer chart for various ornamental plants is presented.

**Dividing and planting bulbous ornamental plants,** F. S. Batson (*Miss. Farm Res.* [*Mississippi Sta.*], *3* (*1940*), *No. 7, p. 2*).—Largely in tabular form, information is offered as to the principal characteristics, requirements as to digging, and planting.

## FORESTRY

**[Forestry investigations by the New Hampshire Station]** (*New Hampshire Sta. Bul. 319* (*1940*), *pp. 36, 37*).—Brief statements are made as to the survival of planted white pine, Scotch pine, Norway spruce, and white spruce, and results are given as to a sustained yield study conducted in the northern part of the State.

**Coniferous forest plantings in central Pennsylvania,** D. D. Stevenson and R. A. Bartoo (*Pennsylvania Sta. Bul. 394* (*1940*), *pp.* [*2*]+*20, figs. 14*).—In connection with a brief history of the establishment of experimental forestry plantings, the first of which were started in 1908, data are presented on the growth and behavior of various species of conifers, both native and exotic. Most of the early plantings were made with seedling stock, later resorting to transplants because of their evident superiority.

Among promising species have been red pine and Norway spruce, grown either in pure stands or as a mixture of the two. White pine was severely injured by weevils, with indications of belated recovery. Pitch pine made almost as good growth as red pine and is recommended for poor, dry sites. Jack pine made more rapid vertical growth than other species. Table mountain pine grew vigorously in early life but had little merit as a forest tree. Scotch, shortleaf, Japanese red, and Austrian pines did not grow well under the conditions existing. Larch, both European and Japanese types, showed adaptability to both upland and lowland sites.

**Forest outings,** edited by R. Lord (*U. S. Dept. Agr., Forest Serv., 1940, pp.* [*XVI*]+*311, pl. 1, figs. 48*).—Information relating to the recreational facilities and opportunities of the national forests is presented in popular form.

## DISEASES OF PLANTS

**Report of the 1940 annual meeting of the southern division of the American Phytopathological Society** (*Phytopathology, 30* (*1940*), *No. 8, pp. 702–711*).—Abstracts of the following papers are presented: A Photo-electric Method and Its Use for Determination of Fungus Growth Rates, by L. A. Adair and E. J. Moore; Infection of Cotton Seedlings in the Greenhouse by *Phymatotrichum omnivorum*, by L. M. Blank; Growth Response of *Phymatotrichum omnivorum* to Certain Inorganic Nitrogens, by L. M. Blank and P. J. Talley; Control of Sclerotiniose of Celery on Florida Muck, by A. N. Brooks; Field Results With Gravity-Graded Cotton Seed, by K. S. Chester; Résumé of Five Years Spraying With Low-Lime Bordeaux Mixture and Zinc Sulphate to Control Pecan Scab and Rosette Diseases, by J. R. Cole; Effect of Girdling and Topping of

*Cotton Plants on Survival of Phymatotrichum omnivorum on the Roots*, and Relation of Age of Cotton Plants to Susceptibility to Field Inoculations with *Phymatotrichum* Root Rot, both by W. N. Ezekial: Field Tests of the Resistance of Cotton to *Phymatotrichum omnivorum*, by G. W. Goldsmith and E. J. Moore; Effectiveness of Organic Manures in Controlling Cotton Root Rot on Various Soil Types, by C. J. King; Cotton-seed Dusting in Relation to Control of Seedling Infection of *Rhizoctonia* in the Soil, by S. G. Lehman; Microorganisms Associated With Cotton-Boll Rots in 1939, by P. R. Miller; Fusarium-Wilt Resistance of New Strains and Hybrid Cottons in Louisiana in 1939, by D. C. Neal and H. B. Brown; Experiments on the Control of Downy Mildew of Cucumbers, by A. J. Plakidas; The Relation of Nitrogen Fertilization of the Peach on the Control of *Bacterium pruni*, by R. F. Poole; Further Studies on the Control of *Cercospora* Leaf Spot of Peanuts With Various Dusts and Sprays, and Results of Four Years of Extension Work on Cotton-seed Treatment in North Carolina, both by L. Shaw; An Occurrence on Cotton of Black Root Rot Caused by *Thielaviopsis basicola*, and Pathogenicity Tests Conducted in 1939–1940 on Different Isolates of *Fusarium vasinfectum*, both by C. D. Sherbakoff; Storage Tests With Cotton-seed, by D. M. Simpson; A Regional Study of the Relationship of Potash Treatments to the Development of Cotton Wilt Under Widely Varying Conditions of Soil and Environment, by A. L. Smith; Notes on the Pathogenic Action of *Phymatotrichum omnivorum*, by G. M. and M. O. Watkins; Fungi Found on Diseased Cotton Seedlings From Thirteen States Surveyed in 1939, by R. Weindling; Root Rot of Austrian Winter Peas and Vetches [and associated fungi], by J. L. Weimer (U. S. D. A. and Ga. Expt. Sta.); Some Observations on the Development of Root-Knot Nematode Diseases in Virginia, by S. B. Fenne; Some Suggestions for Quick Testing of Nematode Resistance in Plant-Breeding Programs, by G. H. Godfrey; Resistance to Root-Knot Nematode in *Nicotiana*, by E. E. Clayton; Control of Root Knot in Florida Cigar-Wrapper Tobacco Fields, by R. R. Kincaid; Comparison of Crop Rotation and Fallowing as Methods on Control for Root Knot of Cotton Under Irrigation, by C. J. King; Recent Root-Knot Damage in Potatoes, by J. T. Middleton; The Effect of Crop Rotation on the Control of *Heterodera marioni* on Norfolk Sandy Loam, by K. J. Shaw; Distribution and Relation of Meadow Nematode, *Pratylenchus pratensis*, to Fusarium Wilt of Cotton in Georgia, by A. L. Smith; On the Occurrence of the Banana Nematode (*Pratylenchus musicola*) in the United States, and The Root-Knot Nematode Attacking Stems and Leaves of Plants, both by G. Steiner; Further Observations on the Nematode-Fusarium-Wilt Experiments at Lumberton, North Carolina, by A. L. Taylor, H. D. Barker, and P. H. Kime; Suggestions Arising From an Analysis of Plants Reported Resistant or Tolerant Toward Root-Knot-Nematode Infestation, by J. Tyler; and Chemical Treatment of Soil to Control the Root-Knot Nematode, by P. A. Young.

**[Abstracts of papers on phytopathology]** (*Assoc. South. Agr. Workers Proc., 41 (1940), pp. 32–35, 155, 156, 159, 160, 178–188, 189–207*).—The following are included: Recent Research in the Control of Bacterial Blight of Snapbeans, by L. H. Person and K. W. Kuitlow (pp. 32, 33) (La. Expt. Sta.); The Epidemiology and Control of Cucurbit Downy Mildew, by C. J. Nusbaum (pp. 33, 34) (S. C. Sta.); The Breeding of Wilt Resistant Watermelons in the South, by M. N. Walker (pp. 34, 35), and Minor Element Deficiency Symptoms of Tung Trees, by R. D. Dickey (pp. 155, 156) (both Fla. Sta.); A Preliminary Report of Pecan Leaf Scorch Studies, by M. B. Hardy, H. Lutz, and S. Merrill, Jr. (pp. 159, 160), and Extension Work on Diseases of Cotton and Other Southern Crops, by R. J. Haskell (pp. 178–181) (both U. S. D. A.); A Photo-Electric Method and Its Use for Determination of Fungus Growth Rates, by L. A. Adair and E. J.

Moore (p. 182); Growth Response of *Phymatotrichum omnivorum* to Certain Inorganic Nitrogens, by L. M. Blank and P. J. Tilley (p. 182) (U. S. D. A.); The Control of Sclerotiniose of Celery on Florida Muck, by A. N. Brooks (pp. 182, 183) (Fla. Sta.); Infection of Cotton Seedlings in the Greenhouse by *Phymatotrichum omnivorum*, by L. M. Blank (p. 183) (U. S. D. A.); Effect of Certain Methods of Treating and Planting Cotton Seed in South Louisiana, by H. B. Brown (p. 184) (La. Sta.); Field Results With Gravity Graded Cotton Seed, by K. S. Chester (p. 185) (Okla. A. and M. Col.); Résumé of Five Years Spraying With Low-Lime Bordeaux Mixture and Zinc Sulphate To Control Pecan Scab and Rosette Diseases, by J. R. Cole and J. R. Large (p. 185) (U. S. D. A.); Effect of Girdling and Topping of Cotton Plants on Survival of *Phymatotrichum omnivorum* on the Roots (pp. 185, 186) and Relation of Age of Cotton Plants to Susceptibility to Field Inoculations With *Phymatotrichum* Root Rot (p. 186), both by W. N. Ezekiel (Tex. Sta.); Field Tests of the Resistance of Cotton to *Phymatotrichum omnivorum*, by G. W. Goldsmith and E. J. Moore (p. 186); Influence of Deep Tillage on Cotton Root Rot Infection, by D. R. Hooton (p. 187) (U. S. D. A.); A New (Virus) Disease of Snap Beans (*Phaseolus vulgaris* L.), by W. A. Jenkins (p. 187) (Ga. Sta.); Preliminary Inheritance Study of *Fusarium* Wilt, by W. H. Jenkins, D. C. Harrell, and J. O. Ware (pp. 187, 188) (U. S. D. A. and S. C. Sta.); Effectiveness of Organic Manures in Controlling Cotton Root Rot on Various Soil Types, by C. J. King (p. 189) (U. S. D. A.); Cotton Seed Dusting in Relation to Control of Seedling Infection of *Rhizoctonia* in the Soil, by S. G. Lehman (p. 189) (N. C. Sta.); Micro-Organisms Associated With Cotton Boll Rots in 1939, by P. R. Miller (pp. 189, 190) (U. S. D. A.); *Fusarium* Wilt Resistance of New Strains and Hybrid Cottons in Louisiana in 1939, by D. C. Neal and H. B. Brown (p. 190) (U. S. D. A. and La. Sta.); Chemical and Physical Studies on Soils From the Regional Cotton Wilt Plots, by L. C. Olson (pp. 190, 191) (Ga. Sta.); Distribution and Condition of Sclerotia of the *Phymatotrichum* Root Rot Fungus in Manured and Unmanured Soils, by O. Parker and C. J. King (p. 191), and A Map History of Some Cotton Root Rot Spots in Arizona, by R. B. Parker and C. J. King (pp. 191, 192) (both U. S. D. A.); Experiments on the Control of Downy Mildew of Cucumbers, by A. J. Plakidas (p. 192) (La. Sta.); The Relation of Nitrogen Fertilization of the Peach on the Control of *Bacterium pruni*, by R. F. Poole (pp. 192, 193) (N. C. Sta.); Number and Viability of Cotton Root Rot Sclerotia From Areas Cropped Continuously to Susceptible and Non-Susceptible Crops (p. 193) and Quality of Cotton Seed From Plants Killed by Cotton Root Rot at Different Dates During the Growing Season and as Affected by Varietal Characteristics (pp. 193, 194), both by C. H. Rogers (Tex. Sta.); Further Studies on the Control of *Cercospora* Leafspots of Peanuts With Various Dusts and Sprays, and Results of Four Years of Extension Work on Cotton Seed Treatment in North Carolina, both by L. Shaw (p. 194) (both N. C. Sta.); An Occurrence on Cotton of Black Root Rot Caused by *Thielaviopsis basicola*, Breeding Disease-Resistant Red Clover, and Pathogenicity Tests of Different Isolates of *Fusarium vasinfectum* During 1939–1940, all by C. D. Sherbakoff (all p. 195) (Tenn. Sta.); Storage Tests With Cotton Seed, by D. M. Simpson (pp. 195, 196), and A Regional Study of the Relationship of Potash Treatments to the Development of Cotton Wilt Under Widely Varying Conditions of Soil and Environment, by A. L. Smith (p. 196) (both U. S. D. A.); The Development of Wilt in a Wilt-Resistant and in a Wilt-Susceptible Variety of Cotton as Affected by the N-P-K Ratio in Fertilizers, by H. B. Tisdale and J. B. Dick (pp. 196, 197) (Ala. Sta. and U. S. D. A.); Notes on the Pathogenic Action of *Phymatotrichum omnivorum*, by G. M. and M. O. Watkins (p. 197) (U. S. D. A.);

Root Rot of Austrian Winter Peas and Vetches, by J. L. Wiemer (pp. 197, 198) (U. S. D. A. and Ga. Sta.); Fungi Found on Diseased Cotton Seedlings From Thirteen States Surveyed in 1939, by R. Weindling (p. 198), and Plant Nematode Council, by H. P. Barss (pp. 198, 199) (both U. S. D. A.); Inducing Uniform Soil Infestations of the Nematode *Heterodera marioni* as an Aid in Breeding for Resistance to Root Knot, by K. C. Barrons (p. 199) (Mich. State Col.); Remarks on Additions to a List of Hosts of the Root-Knot Nematode, by E. M. Buhrer (pp. 199, 200), and Resistance to Root Knot Nematode in *Nicotiana*, by E. E. Clayton (p. 200) (U. S. D. A.); The Bulb Nematode (*Ditylenchus dipsaci*) in Narcissus Plantings in Western Oregon, by C. A. Cole (pp. 200, 201); Some Observations of the Development of Root-Knot Nematode Diseases in Virginia, by S. P. Fenne (p. 201) (Va. Sta.); Some Suggestions for Quick Testing of Nematode Resistance in Plant Breeding Programs, by G. H. Godfrey (p. 201) (Tex. Sta.); Controlling Root-Knot Nematodes in Potatoes in the Klamath Basin by Means of Irrigation, by A. E. Gross (p. 202) (Oreg. Sta.); Control of Root Knot in Florida Cigar-Wrapper Tobacco Fields, by R. R. Kincaid (pp. 202, 203) (Fla. Sta.); Comparison of Crop Rotation and Fallowing as Methods on Control for Root Knot of Cotton Under Irrigation, by C. J. King (p. 203) (U. S. D. A.); Recent Root Knot Damage in Potatoes, by J. T. Middleton (p. 203) (Calif. Citrus Sta.); The Effect of Crop Rotation on the Control of *Heterodera marioni* on Norfolk Sandy Loam Soil, by K. J. Shaw (pp. 203, 204) (U. S. D. A.); Recent Field Observations on Tomato and Cotton Root-Knot Nematodes, by C. D. Sherbakoff (p. 204) (Tenn. Sta.); The Distribution and Relation of the Meadow Nematode, *Pratylenchus pratensis*, to *Fusarium* Wilt of Cotton in Georgia, by A. L. Smith (p. 204) (Ga. Sta. and U. S. D. A.); On the Occurrence of the Banana Nematode [*Pratylenchus musicola*] in the United States, and The Root-Knot Nematode Attacking Stems and Leaves of Plants, both by G. Steiner, and Some Further Observations on the Nematode *Fusarium* Wilt Experiments at Lumberton, North Carolina, by A. L. Taylor, H. D. Parker, and P. H. Kime (all p. 205) (U. S. D. A.); Nematode Population and Species Determination Studies on Soils From the Regional Cotton Wilt Plots, by A. L. Taylor and A. L. Smith (p. 206) (U. S. D. A. and Ga. Sta.); Suggestions Arising From an Analysis of "Plants Reported Resistant or Tolerant Toward Root-Knot-Nematode Infestation," by J. Tyler (p. 206) (U. S. D. A.); and Chemical Treatment of Soil To Control the Root Knot Nematode, by P. A. Young (pp. 206, 207) (Tex. Sta.)

**The Plant Disease Reporter, [August 1 and 15, 1940]** (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 24 (1940), Nos. 14, pp. 277–308; 15, pp. 309–335, figs. 2*).—The following items of interest to phytopathology are included:

*No. 14*.—Plant disease check list revision, including *Amygdalus* spp., by F. Weiss; *Verticillium* wilt of elm, by E. G. Kelsheimer and C. May; *Sclerotinia sclerotiorum* on calceolaria, by H. H. Whetzel and A. W. Dimock; did *Botrytis* actually cause gladiolus blight in Florida? by W. B. Tisdale; bacterial ring rot of potato in the Kansas crop, by L. E. Melchers; ring rot and other potato diseases in the Hastings section of Florida in 1940, by A. H. Eddins; reports on potato late blight from New York and West Virginia; tomato diseases in northeast Texas in 1940, by G. E. Altstatt, P. A. Young, and A. L. Harrison; the 1939 tomato disease situation in Utah, by H. L. Blood and R. M. Christiansen; downy mildew and bulb nematode on onions in New York, by A. G. Newhall; garlic rust (*Puccinia porri*) in California, by M. W. Gardner; downy mildew in Massachusetts tobacco fields, by O. C. Boyd; reports on wheat scab from Pennsylvania, West Virginia, and Indiana; wheat loose smut and other cereal smuts in West Virginia, Indiana, and Kansas; crown rust (*Puccinia coronata*) of oats in Illinois, by G. H. Boewe;

reports on wheat rusts in Indiana and Kansas; *Cercosporella* foot rot of wheat in Idaho; glume blotch of wheat and anthracnose on rye in West Virginia; bacterial wilt of sweet corn in New York; peach leaf curl in Illinois, by G. H. Boewe; and brief notes on phloem necrosis destructiveness in West Virginia, bacterial spot of peach in northeast Texas, and fire blight in West Virginia.

*No. 15.*—Plant disease check list revision, including *Anacardium* through *Bertholletia*, by F. Weiss; notes on the distribution of fungi collected in the southeastern United States in 1938 and 1939, by G. G. Hedgcock; a *Meliola* on a new host genus (*Juniperus virginiana*), by J. A. Stevenson; peach leaf curl in Idaho, by E. C. Blodgett; apple rusts in the Shenandoah Valley, by P. R. Miller; outbreak of *Ascochyta* blight of cotton in Georgia, by B. B. Higgins; black shank in the Burley tobacco section of Kentucky, by W. D. Valleau; reports on potato late blight from Virginia, New York, and Wisconsin; flax diseases in the North Central States, by H. H. Flor; stem rust of oats in Illinois, and alfalfa downy mildew (*Peronospora trifoliorum*) in Illinois, both by G. H. Boewe; and brief notes on grain diseases in Wisconsin, tomato leaf blight severity in middle and southwest Virginia, and cucumber wilt in Virginia.

**[Abstracts of theses]** (*La. State Univ. Bul., n. ser., 32 (1940), No. 1, pp. 31–33, 97, 98*).—Of interest to phytopathology are Studies on Internal Breakdown of Sweet Potatoes, by T. T. Hebert (p. 31); Studies of a New Leaf Spot of Strawberry, by L. W. Lenz (pp. 31, 32); The Soil Rot Disease of Sweet Potatoes Caused by an *Actinomyces*, by W. J. Martin (pp. 32, 33); and Studies of Host-Parasite Relationship in the Red Rot Disease of Sugar Cane, by R. Y. Nesom (pp. 97, 98).

**[Studies in plant pathology by the Massachusetts Station].** (Partly coop. U. S. D. A.). (*Massachusetts Sta. Bul. 369 (1940), 7, 8, 16–18, 22–25, 25–28, 39–41, 76*).—Brief progress reports by members of the station and U. S. Department of Agriculture staffs (W. S. Eisenmenger, K. J. Kucinski, H. F. Bergman, W. L. Doran, E. F. Guba, C. J. Kilgut, M. A. McKenzie, A. V. Osmun, C. V. Kightlinger, H. S. Tiffany, and W. E. Truran) are presented on tobacco black root rot, and overwintering of common tobacco mosaic virus in soil under natural conditions; damping-off of ornamental herbaceous plants due to soil-infesting microorganisms, with special reference to fungicidal control and to the effects of soil treatments and environal modifications on seedlings and cuttings of woody plants; chemical soil surface treatments in hotbeds for control of damping-off of early forcing vegetables; control of tomato leaf mold disease due to *Cladosporium fulvum;* causes and control of decay in winter squash in storage; apple scab control; copper sprays for vegetables; the Dutch elm disease; control of crown root of dogwood; spraying tests for control of rosebloom and fruit rot of cranberries and powdery mildew on garden phlox; and blueberry wilt associated with *Phomopsis.*

**[Phytopathological studies by the Nebraska Station]** (*Nebraska Sta. Rpt. [1939], pp. 13, 26–28*).—Brief reports are included on seed treatment of winter wheat for bunt; breeding and variety tests with reference to resistance to scab and *Fusarium* wilt of potatoes; effect of dry land rotations on potato scab, *Fusarium* wilt, and *Rhizoctonia;* breeding for resistance to bacterial blights of beans; damping-off and storage rots of broadleaf nursery stock (coop. U. S. D. A.); and new disease problems, including bacterial ring rot and *Fusarium* dry rot of potatoes.

**[Plant disease investigations by the New Hampshire Station]** (*New Hampshire Sta. Bul. 319 (1940), pp. 26, 27–30*).—Brief statements of progress are included on plant injuries by lime-sulfur sprays, spraying for apple scab, effect of mulching on bitter pit development in apples, and effect of temperature, soil, and fertilization on potato mosaic and leaf roll, all by O. R. Butler; and ascospore discharge relation to the apple scab spray schedule, by S. Dunn.

**Virus diseases of plants, II,** edited by M. S. Dunin (Dounine) (*Virusnye-bolezni rastenii. Moskva: Vsesoyuzn. Akad. Selsk. Khoz. Nauk Lenina, 1938, vol. 2, pp. 240, figs.* [76]).—The following collected papers appear in this volume: On the Classification of Viruses of Plants, by M. S. Dunin (Dounine) (pp. 7–28); A New Disease of Cotton in Azerbaidzhan (Azerbaijan), by D. D. Verderevskii (Verderevsky) (pp. 29–55); Physiological Changes in Cotton Plants, by L. Kara-Murza (Kara-Mourza) (pp. 56–72); A Comparative Biochemical Description of Healthy Potatoes and Potatoes Affected With Virus Diseases, by R. P. Nikolaev and S. M. Kondrat'eva (Kondratieva) (pp. 73–82); Leaf-Roll of Tomatoes in the District of Kursk and Voronezh, by N. A. Ryakhovskii (Riachovsky) (pp. 83–100); Streak of Tomatoes, by E. A. Asnitskaya (Asnitzkaya) (pp. 101–109); The Spread of Big Bud of Tomatoes in Connection With Ecological Conditions, by M. N. Medish (pp. 110–117); On the Susceptibility of Solanaceae and Convolvulaceae to Big Bud Disease, by I. K. Korachevskii (Korachevsky) and A. V. Semen'kova (pp. 118–124); Virus Diseases of the *Physalis angulata* L., by I. Tsivenko (Tzivenko) (pp. 125–132); Mosaic of Wheat in Voronezh Province, by V. K. Zazhurilo (Sajurilo) and M. Gorlenko (pp. 133–138); Virus Diseases of Fruit Trees, by N. I. Feiginson (pp. 139–180); The Virus Diseases of Cultivated Berry-Bush Plants, by O. B. Natal'ina (Nataljina) (pp. 181–196); On the Isolation of Plants for Virological Experiments, by E. V. Shatova (pp. 197–206); The Microcage for Entomovirological Experiments, by B. G. Krivin (pp. 207–215); On the Problem of the Transmission of Plant Viruses by Insects, by N. S. Sherbinovskii (Sherbinovsky) (pp. 217–219); A Study of the Insect Vector of Virus Diseases of Cotton, by V. N. Rekach (Recach) (pp. 220, 221); On the Physiology of Potato Plants Infected With Rugose Mosaic and Leaf-Roll, by V. F. Kuprevich (Kuprewitch) (p. 222); Virus Diseases of Tobacco in the U. S. S. R., by I. P. Khudyna (pp. 223–225); Virus Diseases of the Soybean, by E. D. Yakimovich (Yakimowich) (pp. 226, 227); Virus Diseases of Oil Producing Plants, by V. N. Yagodkina (Jagodkina) (pp. 228, 229); Virus Diseases of Vegetables and Leguminous Plants in the Ordzhonikidze (Orjonikidze) Region, by V. I. Kozlova (Koslova) (pp. 230, 231); The Virus Diseases of Cultivated Plants in the Saratov Region, by O. N. Vertogradova (pp. 232–237); and Virus Diseases in Cucurbitaceae and Other Plants in the Volga District and the Organization of Virological Work, by M. P. Rodigin (pp. 238, 239).

**The study of plant viruses with special reference to their insect-relationships and some comparisons with the animal viruses,** K. M. Smith (*Roy. Soc. Trop. Med. and Hyg., Trans., 32 (1939), No. 5, pp. 557–574, pls. 4*).—This is a general discussion and critical review (14 references) centering around the symptoms of plant-virus diseases, methods of their spread, and the relationships of viruses and insects, including the question of their multiplication within insect vectors, transmission by larval forms, discontinuous ejection of virus, inheritance of virus, and viruses in relation to nonvectors.

**A design for laboratory assay of fungicides,** J. G. Horsfall, J. W. Heuberger, E. G. Sharvelle, and J. M. Hamilton. (Conn. [New Haven], Minn., and N. Y. State Expt. Stas. et al.). (*Phytopathology, 30 (1940), No. 7, pp. 545–563, figs. 4*).—The authors present a design for measuring the spore-inhibiting aspects of a material as distinct from its tenacity to the sprayed surface, technics for which are being published elsewhere. The problem was to apply known and reproducible deposits onto a surface. The deposit varied directly with air pressure at the nozzle, size of nozzle, length of spraying time, and velocity and dewpoint of the carrier air stream, and inversely with spraying distance and height of lifting the spray fluid. These variables were controlled by fixing the level of the spray fluid, nozzle, and target in relation to each

other, by enclosing the spray stream in a cylinder to prevent wavering and to control its velocity, by metering the spray time with a stop watch, and by the relative humidity of air sprayed through. The resistence level of spores varied with the size, concentration, age, and method of producing them. Accordingly, the standard fungus (*Macrosporium sarcinaeforme*) was grown on oat agar at 30° C. Spores at a concentration of 5,000 per cubic centimeter were germinated at 30° in distilled water without growth stimulant, to avoid the implications of an unstable balance between stimulation and toxicity. A Breed eyepiece micrometer facilitated counting. The slides to be sprayed were coated with cellulose nitrate to asure uniformity in size of drops and deposits of spores. Where the deposits contained detergents, it was necessary to measure and correct for variations in drop size. The spore response to most toxicants proved to be a function of the logarithm of the dose per spore irrespective of the dosage, number of spores, or area covered by the spore drop. Owing to insufficient control over all these variables in the indicator, there remained a residue of variance in day-to-day response. It was found that the magnitude of this variance could be cut in half by expressing the data, not as deposit to give LD50 (lethal dose for 50 percent inhibition), but as a bordeaux coefficient (LD50 of standard bordeaux/LD50 of the unknown). Since the size of both numerator and denominator varies with the resistance level, the size of the quotient varies much less than the LD50.

**A simple single-spore isolator,** S. J. P. Chilton and C. C. Wernham. (U. S. D. A. and Pa. State Col.). (*Phytopathology, 30 (1940), No. 8, pp. 695–697, figs. 2*).—The authors describe and illustrate a simple device for clamping on the microscope substage condenser holder, in which a glass needle is used for isolating single spores.

**Emendations to the second edition of the list of common names of British plant diseases** (*Brit. Mycol. Soc. Trans., 23 (1939), pt. 3, pp. 273–280*).—This supplements the work already noted (E. S. R., 74, p. 47).

**Some resupinate polypores from the region of the Great Lakes, XI,** D. V. Baxter (*Mich. Acad. Sci., Arts, and Letters, Papers, 25 (1939), pp. 145–170, pls. 12*).—In this paper of the series (E. S. R., 83, p. 512), 10 resupinate polypores are presented, including species of *Trametes, Poria,* and *Polyporus* (with some new taxonomy).

**An unusual telial collection of Puccinia graminis,** R. U. Cotter. (U. S. D. A. and Minn. Expt. Sta.). (*Phytopathology, 30 (1940), No. 8, pp. 693–695*).—Teliospores on *Agrostis* stems are reported to have produced aecia on *Berberis vulgaris*, whose aeciospores infected wheat in one trial and rye in another, but not *Agrostis*. When this rust collection was crossed with one from wheat, races of *P. graminis tritici* resulted; when crossed with one of the *secalis* variety, both the *tritici* and *secalis* varieties were obtained; and when crossed with a second collection of rust on *Agrostis*, both *tritici* and *secalis* varieties resulted. Race 161 of the *tritici* variety (a new race) appeared when the *Agrostis* collection was crossed with a race of the *secalis* variety.

**Disease resistance in the soft winter wheats,** R. M. Caldwell. (Coop. Ind. Expt. Sta.). (In *Report of the Sixth Eastern Wheat Conference, 1939. U. S. Dept. Agr., Bur. Plant Indus., 1939, pp. 4–9*).—Resistance to leaf rust, loose smut, bunt, scab, mosaic, powdery mildew, and stem rust is discussed.

**New physiologic races of flax rust,** H. H. Flor. (U. S. D. A. and N. Dak. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 9, pp. 575–591*).—Ten new physiologic races of *Melampsora lini*, besides the 14 previously reported, have been identified by the reaction of 30-day-old seedlings of 11 varieties of flax grown

and tested in the greenhouse during winter at Fargo, N. Dak. To differentiate the new races it was necessary to add to the list of host testers 3 varieties that had previously been considered immune to rust, viz, Argentine (C. I. 462), Bombay (C. I. 42), and Ottawa 770 B (C. I. 355). All of the 201 varieties and strains of flax selected for testing because of diverse morphologic type or rust resistance were susceptible to 1 or more of the 24 identified races. The differential varieties Argentine, Bombay, J. W. S., and Ottawa 770 B appeared to possess distinct factors conditioning immunity to specific races. Of the 201 varieties tested 48 had the reaction of Argentine, 8 the reaction of Bombay, 4 the reaction of J. W. S., and 20 the reaction of Ottawa 770 B to 16 races of *M. lini*. Varieties with the reaction of Ottawa 770 B or Argentine were immune to all North American races but susceptible to one or more of those from South America. Varieties with the reaction of Bombay or J. W. S. were immune to all South American races but susceptible to one or more of those collected in North America.

**Austrian Winter field pea diseases and their control in the South,** J. L. Weimer (Coop. Ga. Expt. Sta.). (*U. S. Dept. Agr. Cir. 565 (1940), pp. 16, figs. 12*).—The Austrian Winter field pea, grown as a winter cover and green manure in several Southern States, is attacked by a number of diseases, some of which have in recent years increased so much in severity that growing of the crop is restricted in certain localities. The leaf spot and black stem fungi live over from one crop season to the next, principally in the soil or in pieces of diseased stems. Since field conditions are so variable, it is impossible to estimate how long these fungi persist in the soil, but they have been found to live 2 yr. or longer. They can be brought to a field by seed, wind, water, or other agencies. The amount in the soil increases from year to year if peas are planted on it each fall. If peas are not planted on the same land oftener than 1 yr. out of 3 or 4, losses can be reduced to a minimum, but susceptible crops such as hairy vetch and the Tangier pea should not be used in the rotation. Crimson clover, bur clover, and cereals are not susceptible, and Monantha, common, and Hungarian vetches, although probably not immune, are highly resistant. No resistant varieties that can be substituted for the Austrian Winter field pea are known.

Leaf blotch kills much leaf tissue and often girdles young stems, but varies greatly in severity from season to season and in different localities. Losses can be held to a minimum by rotations. Root rot may kill the plants in certain areas and thus cause almost total losses. No satisfactory control measure is known, but low wet areas should not be used and the rotation should be as long as practicable. Powdery mildew is often prevalent, especially in the extreme southern part of the pea-growing area, and although it seldom causes much damage by the time the crop is ready to plow under, it may become important when seed-growing is attempted. Bacterial blight, downy mildew, mosaic, *Fusarium* root rot, and stem rot are found at times, but usually do little damage. Rotation should help to hold these diseases in check.

**Results of experiments in control of bacterial ring rot of potatoes in 1939,** T. P. Dykstra (*U. S. Dept. Agr., Bur. Plant Indus., [1940], pp. 8*).—A progress report compiled from data furnished by investigators in California, Colorado, Maine, and Wyoming on control of potato ring rot due to *Phytomonas sepedonica*.

**The resistance of progeny of Katahdin potatoes to viroses,** L. K. Jones, C. L. Vincent, and E. F. Burk. (Wash. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 9, pp. 631–644, figs. 5*).—Field and greenhouse tests with the vein-banding, latent mosaic, tobacco mosaic, and curly top viruses on potato varieties and seedlings are reported upon in detail. A number of potato varieties, including Katahdin and its progeny, showed marked resistance to infection by the first

three viruses. No significant difference in susceptibility to the curly top virus was noted in the seedling lots observed. A variant of the latent mosaic virus causing a mosaic disease on Katahdin is reported.

**Comparative wilt induction by Erwinia tracheiphila and Phytomonas stewarti,** H. A. HARRIS. (Univ. Ill.). *(Phytopathology, 30 (1940), No. 8, pp. 625–638, figs. 2).*—In tests with *E. tracheiphila* infecting cucumber and *P. stewartii* infecting sweet corn, their filtrates from cultures in beef-extract broth solution caused wilting in cuttings of the respective host plants. Transpiration histories of infected plants showed a decrease in water losses during the initial stages of wilting in plants grown either in soil or in nutrient solution. Fluometric data exhibited a marked reduction in water flow through infected compared with noninfected stems. The transpiration and fluometric data would seem to suggest that the primary cause of wilting induced by both organisms is occasioned by a mechanical plugging of the water conduction system.

**Seasonal development, insect vectors, and host range of bacterial wilt of sweet corn,** C. ELLIOTT and F. W. POOS. (U. S. D. A.). *(Jour. Agr. Res. [U. S.], 60 (1940), No. 10, pp. 645–686, figs. 2).*—The authors report upon cooperative investigations of bacterial wilt of sweet corn in Virginia and New York for the 1934–37 seasons and discuss the results in relation to winter temperatures. Following the relatively cold winter of 1935–36 flea beetles were much less abundant early in the season in these regions and wilt was correspondingly less destructive. During the 4 yr. concerned, 28,769 insects representing 94 species and 76 genera were tested for *Aplanobacter stewarti* (=*Phytomonas stewartii*) to determine which might prove to be vectors of wilt under field conditions. Results of these isolations, which included 18,613 individuals of *Chaetocnema pulicaria*, indicated that this is the only species of importance in harboring the wilt organism over winter and also in spreading the disease during the corn-growing season. While *C. denticulata* ranks next in numbers of adults from which these bacteria have been isolated, and may possibly play some part in wilt dissemination, it is apparently not a close second in importance to *C. pulicaria*, and it is doubtful whether the wilt organism ever overwinters in adults of *C. denticulata*. None of the other species from which wilt bacteria have been isolated can be considered vectors of any importance under field conditions. During the 4-yr. period the wilt organism was isolated from *C. pulicaria* collected at Arlington Farm in every month of the year except February, and one isolation was made from beetles collected February 26, 1936, at Norfolk, Va. Early- and late-season isolations from *C. pulicaria* from other localities have shown that overwintering adults are more or less infested in all sections of the country where wilt is prevalent and isolations have been made. *Euchlaena perennis* proved susceptible to infection with the wilt organism, but *Tripsacum dactyloides*, *T. pilosum*, *T. lanceolatum*, and *T. latifolium* were immune in these experiments. Other genera and species tested failed to develop typical wilt symptoms.

**Pink-root disease constitutes a serious problem for onion growers of Colorado,** W. A. KREUTZER *(Colo. Farm Bul. [Colorado Sta.], 2 (1940), No. 3, pp. 13–15, fig. 1).*—A brief account of the symptoms, prevalence, widespread occurrence in Colorado, and difficulties in control. No significant resistance in any commercially desirable variety has yet been found, and crop rotation cannot be recommended since it is shown that the causal fungus *Phoma terrestris* can attack the young roots of many crop plants. Since the parasite invades both living roots and dead outer scales of the onion bulbs, seed rather than set bulbs should be planted, and no plant growing in the soil of a field known to harbor the disease should be transplanted (E. S. R., 81, p. 532).

**Not easy to spot causes of pea root-rot and foot-rot, O. A. Reinking** (*Farm Res. [New York State Sta.], 6 (1940), No. 3, pp. 11, 16, fig. 1*).—Pea root rot is reported to be again in evidence. A study of records over a 15-yr. period revealed that a number of factors are involved in the large fluctuations in yield from year to year, including culture, site, planting time, and presence of disease organisms. Investigations on pea root rot and foot rot during the past 4 seasons indicate that the disease situation is complicated by the large number of different pathogenic soil organisms present. It is believed that the near-wilt fungus (*Fusarium oxysporum* f. 8), widespread in the State, accounts for much of the root rot and foot rot. This progress report gives a general picture of the complex situation and the consequent difficulty of controlling these two disease manifestations.

**The effect of growing and shipping methods on tomato plant diseases,** W. D. Moore. (U. S. D. A.). (*Canner, 90 (1940), No. 11, p. 17*).—A brief summary of the factors found to influence disease incidence in southern-grown tomato seedlings shipped for northern planting.

**Tomato wilt resistance and its decrease by Heterodera marioni, P. A. Young.** (Tex. Expt. Sta.). (*Phytopathology, 29 (1939), No. 10, pp. 871–879*).—"The time-weighted percentages of wilt resistance of 83 varieties including 207 selections of tomatoes were determined by growing their plants in epiphytotics of wilt caused by *Fusarium lycopersici* in the practical absence of other tomato parasites. These percentages were calculated with a new formula that was derived to time-weight 7 percentages of wilting and wilt-killed plants. Time-weighted wilt resistance of 70 percent or more is needed in commercially desirable varieties of tomatoes. These time-weighted percentages describe with mathematical precision the wilt resistance of the tomato varieties under the environmental conditions described. However, according to the general rule, the wilt resistance of tomato varieties is expected to vary in different environments that cause differences in details of cell physiology and structure of both host and parasite. Different physiologic races of the parasite also affect wilt resistance.

"Scarlet Dawn, Glovel, and Norton varieties are markedly susceptible to *F. lycopersici* in this region [eastern Texas], although they are described as being wilt-resistant elsewhere. Selections of Blair Forcing, Buckeye State, Illinois Baltimore, Louisiana Pink, Louisiana Red, Marglobe, Riverside, and Rutgers showed the most marked wilt resistance of the varieties of tomatoes tested. Of the 14 varieties in a special yield test, Pritchard, Michigan State, Break O'Day, Rutgers, Louisiana Pink, and Marglobe gave the best yields in an epiphytotic of *Fusarium* wilt. Large yields were directly correlated with marked wilt resistance. Extensive evidence showed that *H. marioni* greatly decreased the time-weighted percentages of resistance of many tomato varieties to *F. lycopersici*."

**Spraying versus dusting of canning tomatoes with early and delayed applications, J. D. Wilson** (*Ohio Sta. Bimo. Bul. 204 (1940), pp. 76–84*).—The questions raised years ago, and a few new ones, enter into this discussion of an experiment designed to test the relative effectiveness of various materials applied both as sprays and as dusts in applications begun before leaf spot appeared (July 10) and after it had gained a foothold on plants of the canning crop (August 1). The materials compared in early and delayed applications were bordeaux mixture, monohydrated copper sulfate-hydrated lime dust, Tribasic copper, copper oxychloride sulfate, Copper Compound A, Copper Hydro 40, and Cuprocides 54 and G. A. The average yield from plats treated with five applications of dust, beginning on July 10

(early dusts), was 19.8 tons per acre, and this was significantly better than that obtained with early spraying or delayed dusting or spraying. Leaf spot was definitely more severe by September 1 on those plats where dusting or spraying had been delayed until August 1 than on those treated for the first time on July 10. This relative severity was reflected in smaller final yields on October 5 from the delayed treatments. Five applications of spray or dust gave an average increase in yield over untreated plats of ±3.4 tons per acre. With an estimated cost of $3 per acre per application and with grade No. 1 tomatoes at $13.50 a ton, a net return of about $30 per acre was thus obtained by the varied disease control programs tested. No one of the six copper-containing materials used gave results significantly better than those of another when the average yields of all four treatment schedules were considered.

The excellent results with Compound A in the delayed dusting schedule suggest that only the best types of fungicides should be applied in this schedule if *Septoria* leaf spot is to be checked successfully. One of the possibilities in connection with delayed ripening is that it may be possible to lengthen the period of heavy production of ripe fruits from tomato fields suffering severe and rapid defoliation by leaf spot through proper use of a disease-control program. The use of two materials, such as Tribasic copper, with little effect on the date of fruit ripening, and Compound A, which retards ripening to some extent, in different parts of the same field might lengthen this period of peak production of ripe fruits still further. Either dusts or sprays are more effective in controlling *Septoria* leaf spot of tomatoes if applied ahead of the first infection period. Dusting with the fixed coppers may be expected to give satisfactory results if applications are properly timed and sufficient material is used during periods when atmospheric conditions are suitable for dusting.

**A destructive bud-transmissible disease of sour cherry,** G. W. KEITT and C. N. CLAYTON (*Wis. Hort., 30 (1940), No. 10, p. 276*).—Note on the disease previously called "physiological yellow leaf" or "boarder tree," here shown to be bud-transmissible and evidently a virus malady.

**Pathological changes in the phloem and neighbouring tissues of the banana (Musa cavendishii Lamb.) caused by the bunchy-top virus,** C. J. P. MAGEE (*N. S. Wales Dept. Agr., Sci. Bul. 67 (1939), pp. 32, figs. 30*).—The most reliable diagnostic symptom of this disease is said to be the green streaking of the vascular traces in the lamina, midrib, and petiole of the leaves. The presence of these streaks is correlated internally with a profound modification of the structure of the phloem and surrounding tissues of the vascular bundles, details of which are described and illustrated. These abnormalities arise as a result of early aberrations in the ontogeny of the phloem and surrounding tissues during the incubation period of the disease and subsequently as each young leaf develops. The primary effects of the virus are to cause hypertrophy of cell volume and/or the nucleus of any unspecialized cell adjacent to the sieve tubes and hyperplasia of the more distant surrounding cells. The mechanism of these hypertrophies and hyperplasias is not understood, but it is suggested as possible that the virus is a growth-stimulating substance, the relative concentrations of which regulate cell responses. Phloem necrosis is considered of secondary importance to other changes. Replacement of the phloem by morbid tissues is believed responsible, by interfering with translocation, for the accumulation of starch and crystalline material in affected leaves, and ultimately for all the externally observed symptoms. The histopathology of bunchy top is compared with that of potato leaf roll and sugar beet curly top, the similarities being considered most striking.

**Texas citrus diseases, [I, II],** G. H. GODFREY (*Tex. Farming and Citric., 16 (1940), Nos. 11, pp. 8, 14; 12, p. 6*).—General discussions are given of (1) tree diseases and (2) fruit diseases.

**Cephalosporium elm wilt in Massachusetts,** M. A. MCKENZIE and E. M. JOHNSON (*Massachusetts Sta. Bul. 368 (1939), pp. 24, figs. 12*).—This disease, becoming widespread in Massachusetts, is a typical vascular mycosis which cannot be distinguished from other vascular diseases of elm except by identification of the causal fungus from cultural studies of tissue plantings. Under experimental conditions the organism frequently reacts similarly to *Ceratostomella ulmi*, the cause of Dutch elm disease. Infection early in the growing season is apparently more destructive than late in the summer or fall. The external symptoms of the disease are typical of dieback diseases, and the internal symptoms include brown streaks in the wood. Aerial mycelium grows on infected twigs under certain conditions. The evidence at hand supports the hypothesis that the fungus may be spread by spores within the tree. Spores were germinated most readily on potato dextrose agar, in darkness, and in a moist atmosphere. The thermal death point of the fungus was placed between 75° and 80° C., and freezing exerted no influence on the viability of the spores. Sporogenesis was typical of the genus.

Inoculations were made from single-spore colonies in stems and leaves of *Ulmus americana*, *U. americana ascendens*, *U. campestris*, *U. glabra fastigiata*, *U. parvifolia*, and *U. pumila*. Infection followed inoculation of freshly wounded leaves in all cases, and all trees except *U. glabra fastigiata* were infected by twig inoculations in fresh wounds. In nature, comparable fresh injuries by insects would serve readily as infection courts if the insects themselves were the principal vectors, and reports by Becker (E. S. R., 74, p. 523; 77, p. 359) of a native elm beetle invading living cambium may prove to have particular significance in connection with the spread of this *Cephalosporium*. The fact that the findings of the authors agree with previous results obtained in New England and do not agree with those obtained in Nebraska, suggests the possibility that more than one form of *Cephalosporium* may be concerned. Based on the assumption that the fungus is native to the United States, control measures should be directed toward maintaining the vigor of infected elms. Particular attention to the careful pruning out and burning of diseased parts of trees is desirable, and treatment of fresh wounds or scars should be directed toward the avoidance of reviving of latent infections.

**Oak root fungus presents serious economic problem,** R. G. LA RUE (*Citrus Leaves, 20 (1940), No. 3, pp. 5, 6, figs. 4*).—A note on the insidious spread of *Armillaria* root rot in citrus groves of San Bernardino County, Calif., with orchard records and summary of a carbon bisulfide fumigation test apparently indicating more than one treatment per year to be needed.

**Serious disease threatens the sycamore or planetree,** J. M. WALTER, P. V. MOOK, and C. MAY. (U. S. D. A.). (*Arborist's News, 5 (1940), No. 7, pp. 49–55, figs. 2*).—A summary of information on the new disease of sycamore trees due to *Ceratostomella* sp., including its history, distribution, losses induced, hosts, symptoms, cause, dissemination of the fungus, and control.

## ECONOMIC ZOOLOGY—ENTOMOLOGY

**Small mammals and the forest,** W. J. HAMILTON, JR., and D. B. COOK. (Cornell Univ. et al.). (*Jour. Forestry, 38 (1940), No. 6, pp. 468–473, fig. 1*).—The authors emphasize the fact that small mammals are a potent force tending to control insects in the forest, since they are nonmigratory and active throughout the year and potentially more effective than birds. Although the popula-

tions vary over wide limits, numbers are controlled by ecological factors and may be increased only by environmental improvement. Certain forest practices may be detrimental to small mammals in the forest. The contribution is presented with a list of 20 references to the literature.

**Studies on a population cycle of snowshoe hares on the Lake Alexander area.—I, Gross annual censuses, 1932–1939,** R. G. GREEN and C. A. EVANS, (Univ. Minn.). (*Jour. Wildlife Mangt., 4 (1940), No. 2, pp. 220–238, figs. 4*).

**Natural restocking of muskrat-vacant habitats,** P. L. ERRINGTON. (Iowa Expt. Sta.). (*Jour. Wildlife Mangt., 4 (1940), No. 2, pp. 173–185*).

**The summer food of minks and raccoons on the Montezuma Marsh, New York,** W. J. HAMILTON, JR. (Cornell Univ.). (*Jour. Wildlife Mangt., 4 (1940), No. 1, pp. 80–84*).

**Internal parasites of cottontail rabbits in Connecticut,** C. F. CLANCY, E. JUNGHERR, and P. R. SIME. (Univ. Conn., U. S. D. A., et al.). (*Jour. Wildlife Mangt., 4 (1940), No. 2, pp. 162–168, figs. 2*).—In the course of a study of the cottontail by the State Cooperative Wildlife Research Unit a survey was made with a view to determining the species, the incidence, and the seasonal and geographic distribution of parasitic helminths and coccidia of this rodent in Connecticut. "Internal parasites were found in 85 percent of 342 cottontail rabbits collected in different parts of Connecticut. The parasites found and the percentages of all rabbits positive for each parasite were as follows: *Eimeria* sp. (coccidia) 63 percent, *Obeliscoides cuniculi* (stomach worm) 40 percent, *Cittotaenia variabilis* (tapeworm) 32 percent, *Cysticercus pisiformis* (tapeworm cyst) 28 percent, and *Passalurus ambiguus* (pinworm) 6 percent. These parasites appear to occur fairly uniformly in the eastern cottontail (*Sylvilagus floridanus mallurus*) as well as in the New England cottontail (*S. transitionalis*) throughout the State, with the exception of *P. ambiguus*, which was found exclusively in the New England cottontail, and primarily in eastern Connecticut. *Obeliscoides* parasitism was lowest in the winter months."

**A survey of the parasites of the Iowa cottontail (Sylvilagus floridanus mearnsi),** B. B. MORGAN and E. F. WALLER. (Iowa State Col.). (*Jour. Wildlife Mangt., 4 (1940), No. 1, pp. 21–26*).—During the year 1938–39 210 cottontail rabbit carcasses submitted to the laboratory for examination were examined for parasites. All harbored from 1 to 7 species of coccidia, 3 of which had not previously been reported from North American rabbits. "Heavy infestations of the protozoan *Sarcocystis cuniculi* were found in 20 individuals. Three species of fleas, *Cediopsylla simplex*, *Hoplopsyllus affinis*, and *Ctenocephalides canis*, and 1 species of tick, *Haemaphysalis leporis-palustris*, were identified. The tapeworm *Cittotaenia variabilis* was found in 76 of the animals necropsied. Eighty-seven cottontails were infested with the larval stage of *Taenia pisiformis*. The trematode *Hasstilesia tricolor* was found in 11 rabbits. Four species of nematodes were recorded, namely, *Trichuris leporis*, *Trichostrongylus calcaratus*, *Obeliscoides cuniculi*, and *Nematodirus leporis*."

A list is given of 15 references to the literature.

**A field method of analyzing game bird foods,** V. E. DAVISON. (U. S. D. A.). (*Jour. Wildlife Mangt., 4 (1940), No. 2, pp. 105–116*).

**The food habits of the ring-necked pheasant in Minnesota,** L. A. FRIED. (Minn. Expt. Sta.). (*Jour. Wildlife Mangt., 4 (1940), No. 1, pp. 27–36, fig. 1*).—The results of examinations of 515 ring-necked pheasants collected from June 1935 to July 1938, 106 of which were picked up dead during unusually severe weather in January, February, and March of 1936, are reported. It is said that in Minnesota the ring-necked pheasant is chiefly a granivorous bird, preferring cultivated grains at all times of the year. Corn is taken more often

and in greater quantity than any other single kind of food and is the most important item in the pheasant's diet. Damage to newly planted and growing corn by the pheasant has been greatly exaggerated. Less than 1 percent of the corn eaten is sprouted. In May and June, when pheasants are believed to do their greatest damage to corn, the amount of mutilated and silage corn together exceeded by 24.4 percent the amount of perfect corn. While winter feeding probably saved many pheasants from starvation, the high mortality during the winter of 1936 was due more to lack of good cover than to want of food. Proper shelter is at least as important a factor in saving birds during periods of severe weather as is food, and in some cases it is the decisive factor. Pheasants consume a large number of weed seeds, but the effect upon the next year's crop of weeds is probably small. Green and yellow foxtails, common ragweed, and wild buckwheat made up 78.7 percent of all weed seeds eaten. Grasshoppers were eaten more often and in greater numbers than any other kind of animal food. The largest proportions of these insects were taken in April and in July when they were in the egg and nymphal stages, respectively. Thus, pheasants may act as a check not only on the immediate damage to growing crops but also on future grasshopper populations.

**Sex and age ratios in survival of the California quail,** J. T. Emlen, Jr. (Univ. Calif.). (*Jour. Wildlife Mangt., 4 (1940), No. 1, pp. 92–99, figs. 3*).—A total of 17,632 sex and age records on California quail (*Lophortyx californica*) that were taken from various parts of California are summarized and analyzed.

**Economic status of the English sparrow in the United States,** E. R. Kalmbach (*U. S. Dept. Agr., Tech. Bul. 711 (1940), pp. 66, pls. 3, figs. 7*).—The changed agricultural practices, extension of crop areas, phenomenal growth of metropolitan sections, and successive inroads of various new insect pests upon which the bird can prey since the extensive report of Barrows on the economic status of this sparrow in the United States (E. S. R., 1, p. 108) led to the investigation here reported. A total of 8,004 stomachs were examined, this being a larger number than ever before employed in a study of the food habits of a single species of bird. The information thus gained has been analyzed and deductions drawn. "Of the annual food of the adult English sparrow, about one-fifth (19.64 percent) represents services beneficial to man, about one-fourth (24.78 percent) those neutral in effect, and the remainder, a little over half (55.58 percent), those injurious. The feeding on noxious insects (2.67 percent) and weed seeds (16.97 percent) represents the adult bird's meritorious work, whereas its harmful proclivities are centered largely in its consumption of chicken feed, grain of various kinds, and garden truck. In marked contrast to the food of the adult is that of the nestling. Nearly three-fifths (59.38 percent) of its food reflects feeding habits beneficial to man, about an eighth (12.33 percent) those neutral in effect, and the remainder, well over a fourth (28.29 percent), those injurious. Practically all the nestling's beneficial work involves the destruction of injurious insects. Its harmful tendencies include its feeding on chicken feed, grain, and a few useful insects. Despite the commendable food habits of the nestlings, however, and the fact that they outnumber the adults during the breeding season, their influence lasts individually for but a brief span of 10 or 12 days. In the final analysis the benefits accruing from the food habits of the nestlings do not appear to counterbalance the real and potential harm with which the adults must be charged.

"This conclusion concerning food habits is applicable to those situations or conditions that may be considered average in character. There are circumstances and environments in which such an appraisal is too severe, and

again there may be those in which the English sparrow, through excessive numbers, deserves even more emphatic condemnation and becomes a fit subject for control."

A list of 42 references to the literature is included.

**Banding woodcocks on Pennsylvania singing grounds,** R. T. NORRIS, J. D. BEULE, and A. T. STUDHOLME. (Pa. Expt. Sta.). (*Jour. Wildlife Mangt., 4 (1940), No. 1, pp. 8–14, pl. 1, fig. 1*).

**A venture in songbird management,** W. L. MCATEE (*Jour. Wildlife Mangt., 4 (1940), No. 1, pp. 85–89*).

**Entomological usage of subspecific names,** C. W. SABROSKY. (Mich. Expt. Sta.). (*Ent. News, 51 (1940), No. 6, pp. 159–164*).

**The aircraft insect problem,** H. L. RAMSEY (*Soap and Sanit. Chem., 15 (1939), No. 10, pp. 99, 101*).

**Insulation not always what it seems: Thousands of insects may emerge from wrong materials,** H. H. SHEPARD. (Minn. Expt. Sta.). (*Pests, 8 (1940), No. 2, pp. 13, 14, figs. 4*).

**The control of pests of farm and garden crops,** J. HENDRICK and W. MOORE (*Highland and Agr. Soc. Scot. Trans., 5. ser., 52 (1940), pp. 37–58*).

**Chemistry in pest control,** R. C. ROARK. (U. S. D. A.). (*Soap and Sanit. Chem., 15 (1939), No. 11, pp. 93, 95, 97, 123*).

**The incorporation of direct with protective insecticides and fungicides.—IV, The evaluation of the wetting and spreading properties of spray fluids,** H. MARTIN (*Jour. Pomol. and Hort. Sci., 18 (1940), No. 1, pp. 34–51*).—A continuation of this series of studies (E. S. R., 80, p. 512), which has resulted in the devising of a laboratory method suitable for the assessment of the wetting and spreading properties of spray fluids.

**Test methods for recording moribund kill,** H. E. WHITMIRE (*Soap and Sanit. Chem., 15 (1939), No. 11, pp. 99, 101, 103, 123, fig. 1*).

**Some preliminary experiments with β-butoxy-β′-thiocyanodiethylether as an industrial insecticide,** C. POTTER and A. J. MUSGRAVE (*Ann. Appl. Biol., 27 (1940), No. 1, pp. 110–121*).—Report is made of preliminary experiments aimed at the determination of the toxicity of β-butoxy-β′-thiocyanodiethylether (normal butylcarbitolthiocyanate) to some industrial and household insect pests. "The insecticide was found to be toxic as a spray and had a marked effect in its vapor phase (except on *Tenebrio molitor* L.); under suitable conditions it could also be made to form a toxic film on wooden surfaces. The thiocyanate appeared to be particularly toxic to the eggs of the bedbug (*Cimex lectularius* L.). The following were used as test insects: *Sitophilus granarius* L., *S. oryzae* L., *Caulophilus latinasus* Say, *Lasioderma serricorne* F., *Oryzaephilus surinamensis* L., *Tribolium castaneum* Hbst., *Plodia interpunctella* Hb., *Ephestia kuehniella* Z., *Cimex lectularius* L., *Tenebrio molitor* L., *Dermestes vulpinus* F., and *Ephestia elutella* Hb. Of these insects all, except *D. vulpinus* and *T. molitor*, which were used only in experiments on the toxicity of the vapor, were susceptible in varying degrees to the thiocyanate in one form or another. The thiocyanate appears therefore to have considerable promise as an industrial insecticide either alone or mixed with other toxic substances, e. g., pyrethrum or derris."

**Preliminary selection experiments with Derris,** C. D. V. GEORGI, J. LAMBOURNE, and G. L. TEIK (*Malayan Agr. Jour., 24 (1936), No. 8, pp. 374–389*).—The results of a survey of the principal species of *Derris* being grown in Malaya, undertaken to determine the variations in toxic content as shown by chemical analysis between roots of individual plants, are reported, the details being given in 15 tables. The species of *Derris* examined included *D. malac-*

*censis sarawakensis*, *D. elliptica* (Sarawak creeping), *D. elliptica* (Serdang type), *D. polyantha* ?, *D. elliptica* (Singapore type), and *D. malaccensis* (Kinta type).

**Variations in toxicity of some races of Derris elliptica**, C. D. V. GEORGI, J. LAMBOURNE, and G. L. TEIK (*Malayan Agr. Jour., 25 (1937), No. 5, pp. 187–200, pl. 1*).—The results of further experiments (see above) aimed at the isolation of high rotenone content strains of *D. elliptica* are reported, the details being given in 10 tables.

**Further experiments with selected plants of Derris elliptica, Changi No. 3**, C. D. V. GEORGI and G. L. TEIK (*Malayan Agr. Jour., 28 (1940), No. 2, pp. 44–68*).—In continuation of the above, cuttings from certain outstanding plants were propagated as individual clones with a view to studying intra- and inter-clonal variations. The results, the details of which are given in 21 tables, are summarized under the headings of yield of root, ether extract of root, rotenone content of root, and correlation between rotenone and ether extract.

**Factors influencing the use of some common insecticide-dispersing agents**, L. H. DAWSEY (*U. S. Dept. Agr. Cir. 568 (1940), pp. 10*).—Report is made of a laboratory investigation of the dispersing efficiency, cost, stability against water hardness, heat, and bacteria, and versatility in dispersing different kinds of material of 14 commonly used agents. These dispersing agents were tested with refined petroleum oil, phenothiazine, menhaden fish oil, rosin residue, and paraffin. Only 4 out of the 14 agents, ammonium caseinate, glue, arabic gum, and whole-milk powder, were capable of dispersing all the materials. The best all-around agent was arabic gum. In the unstable class, blood albumin, egg albumin, ammonium caseinate, glue, and whole-milk powder were the most efficient, in the order named. Their chief usefulness appeared to lie in the preparation of insecticidal sprays which are to be used within 24 hr. after mixing. In the emulsification of refined petroleum oil, blood albumin was the best agent in the unstable class and arabic gum in the stable class. For menhaden fish oil, bentonite clay was the best agent regardless of class. For rosin residue, whole-milk powder was the best agent in the unstable class and arabic gum in the stable class. In the dispersion of paraffin, ammonium caseinate was the best agent in the unstable class and arabic gum in the stable class. For phenothiazine, whole-wheat flour was the best agent in the unstable class and arabic gum in the stable class. No correlation of practical value was found between the dispersing efficiency of the agents and their tendency to foam.

**Insect pests of cabbage present perplexing problems**, G. E. R. HERVEY (*Farm Res. [New York State Sta.], 6 (1940), No. 3, pp. 5, 6, fig. 1*).—A practical discussion of control measures for cabbage insects, including spray and dust formulas and methods of application.

**Control of the major pests of the Satsuma orange in south Alabama**, L. L. ENGLISH and G. F. TURNIPSEED (*Alabama Sta. Bul. 248 (1940), pp. 48, figs. 17*).—The details of the seasonal history and control work with insect pests and sour scab disease of the Satsuma orange, which have been conducted at the Spring Hill Field Station since 1928, are presented in tables and charts. Of the several insects, including purple scale, citrus rust mite, citrus whitefly, and citrus red mite, the first mentioned is said to be of greatest importance. If uncontrolled the purple scale may cause from 75 to 80 percent of the fruit to be classed as culls, and trees may be seriously devitalized or even killed. Its development is almost continuous but is retarded by cold weather. The shortest life cycles and the greatest hatch of eggs take place during the warm summer months.

Spring applications of bordeaux-oil and bordeaux-sulfur aid in controlling the purple scale, but the opportune time to use an oil spray is in July. Only one oil spray per year is required for commercial control. Frequent use of sulfur sprays gives only partial control of scale. The citrus rust mite, in the absence of control measures, may russet young fruits in the early summer, but more serious damage is caused by the late summer or early fall infestation, when, if uncontrolled, from 50 to 70 percent of the fruit may be russeted. It is readily controlled by sulfur sprays or dusts, the dust being preferable. Bordeaux-oil mixture has been found effective against the citrus whitefly, the optimum time of application being just before the adults begin to emerge. Oil sprays have been found effective against the citrus red mite. If applied in July they will keep trees relatively free from mites for several months and if applied every year, control is easily maintained. The sour scab disease, which causes bumpy fruit, is best controlled by the regular use of bordeaux mixture or sulfur fungicides twice a year, one application before growth of the trees commences in the spring and the other after petal fall.

"Oil sprays prepared from highly refined white oils are much more desirable for use on Satsumas than those prepared from unrefined oils. This is especially so when the trees are subjected to critical climatic conditions. Spray programs containing applications of oil in July and September seriously delay maturity and reduce the yield of Satsumas after the first year. However, a refined white oil with a viscosity of 78–80 sec. (Saybolt) was applied at a concentration 1.5 percent in July for 4 successive years without material effect on the maturity or yield of the fruit. Although liquid lime-sulfur was conducive to early maturity of the fruit, the occasional severe injury caused by this spray makes its use unwise. Sulfur applications should be confined to dust and to wettable sulfur. Spray schedules for effective and economical control of sour scab and the arthropod pests of Satsumas are given."

A list of 33 references to the literature cited is included.

**[Contributions on fruit and nut insects]** (*Oreg. State Hort. Soc. Ann. Rpt., 31 (1939), pp. 37–45, 57–64, 67–72, 119–124, 136–140, figs. 4*).—Contributions relating to economic insects presented at the annual meeting of the Oregon State Horticultural Society and the Western Nut Growers Association held in December 1939 include The Pear Psylla—an Important Pear Pest, by L. G. Gentner (pp. 37–39), and Pear Psylla a Threat to the Northwest Pear Industry (pp. 41, 43–45) and Oil Sprays and Their Effects in Hood River (pp. 57–63), both by L. Childs (all Oreg. Expt. Sta.); Cherry Fruit Fly Situation, Hood River County, by A. L. Marble (pp. 67, 68); Observations and Experiments on the Removal of Spray Residues in the Yakima Valley, by A. L. Ryall (pp. 68–72) (U. S. D. A.); Injury to the Tree and Fruit From Different Sprays Applied in 1939, by F. L. Overley, E. L. Overholser, and D. F. Allmendinger (pp. 119–124) (Wash. Sta.); and Progress Report on Filbert Insect Investigations, by B. G. Thompson (pp. 136–139) (Oreg. State Col.).

**The detection of wood-boring insects by means of X-rays, R. C. Fisher and H. S. Tasker** (*Ann. Appl. Biol., 27 (1940), No. 1, pp. 92–100, pls. 2, fig. 1*).—The investigation reported led to the conclusion that the "general condition of a sample of wood can readily be determined by X-ray examination. For example, the presence of insect tunnels and the extent of disintegration within a sample can be detected with ease, even when not apparent from its external appearance. In favorable cases the presence or absence of insects can be ascertained, but for the results of the examination to be conclusive the sample must not be too thick, and above all, must not be severely disintegrated and powdered. It is not possible to state definitely the limits of thickness through

which various insects can be detected; this depends primarily upon the state of the wood and, secondly, on the stage and size of the insects and the amount of frass in the tunnels in their immediate neighborhood. When insects can be detected their movements can be followed by taking radiographs at successive intervals of time. The method might prove of value in laboratory studies of wood-boring insects when the progress of development cannot usually be determined without destructive examination of the infested samples. It appears that the practical application of X-rays for the detection of wood-boring insects will be confined to timber of small dimensions, e. g., small articles of furniture, picture panels and frames, plywood, etc., and, where cost allows, could be used for determining the efficacy of methods of control by insecticide or fumigation treatments applied to such material. The examination of structural timbers in situ in buildings for the detection of the death-watch beetle [*Xestobium rufovillosum* De G.] is in general impracticable. Such timbers are usually of large dimensions, and while it is reasonably certain that larvae favorably situated would be detected, a negative result would be inconclusive and beetles would generally not be located. The X-ray equipment best suited to the radiography of wood is one with a high power output operating in the voltage range 10–40 kv. power. A Grenz-ray tube or an X-ray tube having a very thin window is essential if kilovoltages below 20–25 are to be used."

**[Work in entomology by the Massachusetts Station]** (*Massachusetts Sta. Bul. 369 (1940), pp. 33–37, 45–48, 49, 57–66, pl. 1*).—The work of the year reported upon (E. S. R., 81, p. 540) relates to injurious and beneficial insects affecting the cranberry, including the fire beetle *Cryptocephalus incertus*, cranberry weevil, cranberry spittle insect *Clastoptera saint-cyri*, rootworm *Colaspis brunnea costipennis*, hill fireworm *Tlascala finitella* Walk., Atlantic cutworm *Polia atlantica*, gypsy moth, cranberry root grub *Amphicoma vulpina*, cranberry fruitworm, black-headed fireworm *Rhopobota* sp., and the blunt-nosed leafhopper *Ophiola* sp., by H. J. Franklin; investigations of materials of promising value in insect control (particularly oil sprays for dormant applications, dormant sprays for control of bud moth, and summer sprays for apples) and apple maggot control, both by A. I. Bourne and W. D. Whitcomb; control of striped cucumber beetle, cabbage maggot, squash vine borer, biology and control of the apple leaf curling midge *Dasyneura mali* Kieff., control of plum curculio in apples, and liberation of parasites of the European earwig, all by Whitcomb; control of onion thrips, the spray residue problem, insecticides for the control of European corn borer, potato spraying experiments, and introduction of parasites of oriental fruit moth in peach orchards, all by Bourne; naphthalene and similar compounds as greenhouse fumigants, by Whitcomb and W. Garland; control of the common red spider on greenhouse plants, by Whitcomb, Garland, and W. E. Tomlinson, Jr.; biology and control of the grape plume moth and grape cane girdler *Ampeloglypter ater* Lec., by Whitcomb and Tomlinson; and insects concerned in the dispersal of Dutch elm disease and the effects of solar heat on the subcortical development of the native elm bark beetle, both by W. B. Becker.

**[Work with insects by the Nebraska Station]** (*Nebraska Sta. Rpt. [1939], pp. 30–32*).—The work of the year reported upon (E. S. R., 81, p. 672) includes reference to the hessian fly, chinch bug, and grasshopper control.

**[Work in entomology by the New Hampshire Station].** (Partly coop. U. S. D. A.). (*New Hampshire Sta. Bul. 319 (1940), pp. 34–36*).—Brief reference is made (E. S. R., 82, p. 217) to a study of the penetration of contact insecticides, by W. C. O'Kane, J. G. Conklin, L. C. Glover, and R. L. Blickle, and of ovicides, by O'Kane, Blickle, and Glover; and the occurrence of the European corn borer, gypsy moth, and European spruce sawfly, by O'Kane.

**Insect and other pests of 1939,** A. E. Cameron (*Highland and Agr. Soc. Scot. Trans., 5. ser., 52 (1940), pp. 91–115, figs. 8*).—A continuation of the annual reports on the economic insects of Scotland (E. S. R., 81, p. 809).

**A key to the Acrididae (Orthoptera) of northeastern Texas with ecological notes,** H. Knutson (*Field and Lab., 8 (1940), No. 2, pp. 33–58, figs. 3*).

**The hairworm Gordius robustus Leidy as a parasite of the Mormon cricket (Anabrus simplex Haldeman),** G. Thorne. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 30 (1940), No. 5, pp. 219–231, figs. 7*).—The nematode *G. robustus* was first observed as an important parasite of the Mormon cricket in 1935 in the vicinity of Arrowrock Reservoir, Idaho. In certain localities of this area there are favorable breeding grounds for this nematode along small mountain streams and in pools or swamps, and it should be of economic importance in the control of ordinary populations of this pest. "However, during heavy outbreaks of crickets, such as occurred in 1935 to 1937, the percentage of parasitism was too small to be of economic importance, although in some instances it reached 25 to 50 percent of the crickets. Similar parasitism was also observed near Augusta and Cutbank, Mont., where in certain small areas 50 to 99 percent of the crickets contained Gordii. Parasitized crickets rarely produce eggs. They live normally until the mature *Gordius* breaks through the abdominal wall and enters water or wet soil. Here the Gordii mate and later hibernate in moist places under sticks and stones or among roots and rubbish. Some eggs are deposited in fall but more generally in spring, when the females emerge from hibernation and deposit them along the shores of streams, ponds, or swampy areas. Here the minute larvae hatch and probably are picked up by the young crickets when drinking water or eating aquatic vegetation. Upon reaching the intestine of the cricket they apparently bore through the wall and enter the body cavity, remaining there until maturity. Under present erosion conditions in breeding areas of the *Gordius* most of them are carried away by floods." A list of 11 references to the literature is included.

**Evidence for the identity of the yellow-spot virus with the spotted-wilt virus: Experiments with the vector, Thrips tabaci,** K. Sakimura. (Hawaii. Pineapple Prod. Expt. Sta.). (*Phytopathology, 30 (1940), No. 4, pp. 281–299, figs. 4*).—In the work reported the yellow spot virus was recovered by the onion thrips from field-infected tomatoes. This virus was transmitted by the onion thrips to and recovered from spinach, broadbean, celery, potato, eggplant, bell pepper, tomato, tobacco, *Nicotiana glutinosa, Datura stramonium,* petunia, chicory, endive, and lettuce, which are known also to be susceptible to the spotted wilt virus. A list of 49 references to the literature cited is included.

**Hydroxyl-ion concentration of the saliva of partly desiccated beet leaf hoppers,** J. M. Fife. (U. S. D. A.). (*Phytopathology, 30 (1940), No. 5, pp. 433–437, fig. 1*).—In the study reported the saliva of beet leafhoppers that had been kept without food or water for from 18 to 24 hr. was found to contain a high concentration of hydroxyl ions. Measurements and calculations show that the pH of normal leafhoppers' saliva is greater than 10 and may reach approximately 11 in the saliva of desiccated leafhoppers.

**An undescribed Corythucha (Tingitidae-Hemip.) from Colorado [C. tuthilli],** C. J. Drake. (Iowa State Col.). (*Ent. News, 51 (1940), No. 6, p. 172*).

**The toxicity of sulphur dioxide to the bed-bug (Cimex lectularius L.),** H. C. Gough (*Ann. Appl. Biol., 27 (1940), No. 1, pp. 101–109, figs. 3*).—Experiments reported have shown that the egg of the bedbug is more resistant to sulfur dioxide than is any other stage. "This resistance is greatest during the first half of the incubation period and then gradually decreases. Nymphs

resistant than recently fed ones. From preliminary experiments it appears that resistance of nymphs starved for long period may be nearly as high as that of eggs."

A list of 21 references to the literature is included.

**The mealybug makes a discovery, W. J. Schoene and G. M. Shear** (*Va. Fruit, 28 (1940), No. 5, pp. 18, 19*).—This is a discussion of the factors responsible for the greater injury caused by the mealybug in well sprayed and fertilized orchards than in partially sprayed and unfertilized orchards.

**Resistance of corn strains to the leaf aphid, Aphis maidis Fitch, R. O. Snelling, R. A. Blanchard, and J. H. Bigger.** (Ill. Expt. Sta., U. S. D. A., et al.). (*Jour. Amer. Soc. Agron., 32 (1940), No. 5, pp. 371–381, fig. 1*).—The studies here reported indicate a possibility of reducing injury caused by the corn leaf aphid through host resistance. The prevention of its injury is a problem of special importance in the production of certain foundation seed stocks used in the production of commercial hybrid seed corn. Its infestation was determined by an examination of recently emerged tassels for the presence of the aphids. "Although the severity of the infestations was measured by classifying all infested plants in one of three infestation classes, in general the total percentage of infestation was considered as a reliable indicator of the relative resistance or susceptibility. Data are presented from many yellow and white inbred lines as well as from a sufficient number of single crosses to indicate that resistance to this insect is a heritable character." The contribution includes a list of 31 references to the literature cited.

**Nicotine sulphate dust for control of cotton aphids, A. L. Hamner** (*Miss. Farm. Res. [Mississippi Sta.], 3 (1940), No. 7, p. 1*).—Attention is called to the importance of cotton aphid infestations of fruiting cotton, often overlooked by cotton planters. The best control for such infestations has been found to be a 5 percent nicotine sulfate dust (2 percent free nicotine) applied at the rate of 10 lb. per acre on cotton of average height.

**The biology of the Rubus aphides, G. H. L. Dicker** (*Jour. Pomol. and Hort. Sci., 18 (1940), No. 1, pp. 1–33, pl. 1, figs. 2*).—An account is given of the biology of *Macrosiphum rubiellum* Theo., *M. rubifolium* Theo., *Amphorophora rubi* (Kalt.), and *Aphis idaei* Van der Goot, and notes on an unidentified species and on six other species recorded from *Rubus* in Great Britain, followed by information on the parasites and predators and statistical investigation of the sampling methods used to obtain population data. A list of 23 references to the literature is included.

**Notes on some Ohio aphids, C. F. Smith.** (N. C. Expt. Sta.). (*Ohio Jour. Sci., 40 (1940), No. 3, pp. 139–142*).—The species *Aphis acritus* taken on *Sedum* and *Capitophorus ohioensis* from the underside of leaves of *Helianthus* sp. are described as new. Notes are given on the occurrence of 20 other species.

**The walnut caterpillar, L. Haseman** (*Missouri Sta. Bul. 418 (1940), pp. 14, figs. 11*).—A practical account is given of the walnut caterpillar, which is a source of injury to black walnut, hickory, and pecan trees in Missouri. Of its several natural enemies, two small hymenopterous egg parasites, *Telenomus ichthyurae* Ashm. and *Trichogramma minutum*, were found to be the most important. When control measures are necessary, either poison spray or hand destruction of the colonies of caterpillars is effective.

**The length of development of the greater wax moth, M. H. Haydak.** (Univ. Minn.). (*Science, 91 (1940), No. 2370, p. 525*).—Reference is made to the rearing of 35 generations of healthy wax moths on the special food formula previously described (E. S. R., 76, p. 357).

**Life history and effective control of asparagus fern caterpillar, J. W. Wilson.** (Fla Expt. Sta.). (*South. Florist and Nurseryman, 49 (1940), No. 10,*

*pp. 9, 23, 24*).—The author reports having found arsenate of lead dust to be effective against the asparagus fern caterpillar. Eight different species of parasites and two predators have been found feeding on this pest in ferneries, with four secondary parasites attacking the primary parasites. Of the eight species, *Chelonus texanus* Cress. was the most abundant, closely followed by *Euplectrus platyhypenae* How. Two predators were observed, namely, the large wasp *Polistes fuscatus rubiginosus* Lep. and the spined soldier bug.

**Observations on Stenoma mistrella Busck (Stenomidae, Lepidoptera)**, H. D. O. MILLER. (Kans. Expt. Sta.). (*Jour. Kans. Ent. Soc., 13 (1940), No. 1, pp. 1–3, figs. 7*).

**Fighting codling moth with chemically treated bands**, A. H. TESKE (*Va. Fruit, 28 (1940), No. 5, pp. 16, 17*).—It is concluded that the codling moth bands treated with β-naphthol when applied at the proper time and in the proper manner can be expected to "catch from 60 to 70 percent of the worms of the first brood that leave the fruit. Estimating that on the average these bands will catch 50 out of every 100 worms that leave the fruit, and that 50 percent of these worms will develop into female moths and that an average single female will lay 100 eggs, it can be readily seen that bands would reduce the late worm population very materially and that bands should be one of the best investments that a grower could make."

**The importance of local mosquito surveys in Minnesota**, W. A. RILEY. (Univ. Minn.). (*Minn. Acad. Sci. Proc., 7 (1939), pp. 7–10*).

**The biology of the chrysanthemum midge in England**, H. F. BARNES (*Ann. Appl. Biol., 27 (1940), No. 1, pp. 71–91, pl. 1, figs. 5*).—A report is made upon a study of the life history of the chrysanthemum midge at the Rothamsted Experimental Station under both laboratory and unheated glasshouse conditions. Field observations have shown that the midge behaves in commercial nurseries in much the same way as in the experiments conducted in the unheated glasshouse throughout the year. "For total eradication it is shown that fumigation and spraying are not economical. Dipping the cuttings in nicotine-soft soap solution greatly reduced the numbers of developing midges. The most hopeful method of eradicating the pest seems to be cutting down the entire plant, then isolating the cut down stools, and subsequently using the new growth for cuttings."

**New and little-known Utah Dolichopodidae (Diptera)**, F. C. HARMSTON and G. F. KNOWLTON. (Utah Expt. Sta.). (*Ent. News, 51 (1940), No. 5, pp. 129–134, figs. 2*).—The species *Dolichopus vernaae* and *Syntormon uintaensis*, both from Utah, are described as new to science, and descriptions are given of two additional species (*Polymedon castus* Wheeler and *Parasyntormon hendersoni* H. & K.).

**Toxicity tests with the Queensland fruit fly Strumeta (Chaetodacus) tryoni Froggatt**, S. L. ALLMAN (*Jour. Austral. Inst. Agr. Sci., 6 (1940), No. 1, pp. 40–44*).

**Biology of the seed-corn maggot in the Coastal Plain of the South Atlantic States**, W. J. REID, JR. (*U. S. Dept. Agr., Tech. Bul. 723 (1940), pp. 44, figs. 7*).—Report is made of studies of the biology of the seed-corn maggot, which attacks a wide range of food plants, including several important vegetable crops, namely, potatoes, beans, spinach, cabbage, melons, and peas, conducted from 1925 to 1935, inclusive, in eastern portions of North Carolina and South Carolina, with a view to devising a means of preventing its injury to potato seed pieces and spinach seedlings. It was found that mating in captivity was rare, but otherwise the insect could be reared without great difficulty in the cages described. Immature stages live in the soil. The incubation period of the egg varied from 1 to 8.5 days at mean temperatures ranging from 83.7° to 42.5° F., respectively. Eggs hatched at mean temperatures as low as 40°–45° and as high as 95°, but

not at 100°. The larval stage lasted from 5 to 78 days at mean temperatures of from 100° to 40°–45°, with a range of from 7 to 26 days during the period that seed potatoes are attacked. The pupal stage lasted from 7 to 26 days at mean temperatures from 83.7° to 54.1° and as long as 126 days at 40°–45°. Mated females lived an average of 34 days in confinement and laid an average of 97.25 eggs; mated males lived an average of 29 days. Sprouting beans, potato seed pieces with poorly healed or decaying cut surfaces, and such organic fertilizer materials as cottonseed meal were favorite larval foods. Immature stages were present in the fields from late in September through April, with peaks of larval abundance in November and in March. Only adults, chiefly females, were found in the fields during the summer months.

**Kentucky white grubs, P. O. Ritcher** (*Kentucky Sta. Bul. 401 (1940), pp. 71–157, pls. 6, figs. 40*).—The results of early observations and work under way continuously from April 1936 relating to the biology and control of white grubs in Kentucky are reported. Studies of species belonging principally to the genus *Phyllophaga*, 36 of which are recorded from the State, have shown them to be widespread and of great potential importance. The life history studies indicate that these species have 2-, 2- and 3-, or 3-yr. life cycles. The life cycles of *P. hirticula*, usually a 3-yr. species, and *P. ephilida*, a 2-yr. species, are charted. It is concluded that the May beetles spend at least the first part of the winter in their pupal cells, some species beginning to burrow toward the surface in January or February. A detailed account is given of the sequence of emergence, seasonal abundance, and feeding preferences of many species of May beetles for a number of the State's physical divisions. Most of the stripping of oaks in May in the Inner Bluegrass region of the State is done by *P. hirticula*, the dominant species. A study of light traps showed the common 100-w., white, frosted bulb to be a more efficient lure than similar 60- or 200-w. bulbs. Individual May beetles were found to lay approximately 50 eggs which hatched in from 15 to 29 days, depending upon the species and the soil temperature.

Their larval life in the soil and food preferences are considered at length, and a key is included, by means of which the larvae of 23 species may be distinguished. *P. ephilida* was found to differ from most other grubs in its hibernation habits of overwintering only 3 in. deep in the soil. The time of pupation and the length of the pupal stage are discussed, and evidence is presented to show that some species, such as *P. hirticula*, pupate deep in the soil, while such species as *P. inversa* and *P. ephilida* pupate at shallow depths. The life histories of *Cyclocephala immaculata*, *Anomala innuba*, *A. nigropicta*, and *A. flavipennis* are discussed, and mention is made of *C. borealis*, *A. binotata*, and the green June beetle, all of which have 1-yr. life cycles. A number of natural enemies were found attacking white grubs in various stages of their life cycles. *Diogmites discolor* Loew is recorded as a common parasite of May beetle pupae. The methods used in the course of this study are considered.

A bibliography of 40 references is included.

**Notes on Texas Phyllophaga, with description of one new species (Coleoptera, Scarabaeidae), H. J. Reinhard.** (Tex. Expt. Sta.). (*Jour. Kans. Ent. Soc., 13 (1940), No. 1, pp. 4, 5*).—The May beetle *P. sodalis* from Texas is described as new, and the name *P. pleroma* is proposed for *P. plena*, which is unavailable due to prior use. A note on *P. renodis* Reinhard is included.

**Continued culture of a nematode parasitic in the Japanese beetle, R. W. Glaser** (*Jour. Expt. Zool., 84 (1940), No. 1, pp. 1–12*).—The author has found that the sterility of females which results from prolonged culture of the parasitic nematode *Neoaplectana glaseri* on a standard medium may be prevented by (1) host passage, (2) use of desiccated material from the host, and (3) by use

of desiccated, bovine, ovarian substance. "After a number of generations in the host or in the presence of the desiccated materials, the parasites again usually developed on the standard medium for a large number of generations. The results indicated that some growth factor initially stored within the tissues was diluted with each generation until depletion occurred. This growth factor was restored to the parasite tissues by proper treatment over many generations. By testing various materials, it was found that, under culture conditions, living *yeast, host substance, and especially bovine ovarian substance, were necessary* to the prolonged normal development of the nematodes. When living yeast and one of these substances were combined, the character of the growth and survival was greatly improved. A variation in the growth and survival of certain strains was observed. The prevention of extinction of *Neoaplectana* cultures by the use of ovarian substance has proved valuable during the course of some economic work conducted jointly by the State of New Jersey and the Federal Government, Tests with certain sex hormones and other glandular preparations alone and in conjunction with various proteins failed to throw light on the nature of the stimulating factor or factors present in bovine ovarian substance."

**The milky disease vs. the Japanese beetle,** E. N. Cory (*Sci. Mo., 50 (1940), No. 6, pp. 574–576, figs. 2*).—This contribution relates to the application of the so-called milky disease of the Japanese beetle in the retardation work under way with this pest in Maryland, recent reports of which disease by White and by White and Dutky have been noted (E. S. R., 83, pp. 374, 375).

**White grubs and their control in eastern Canada,** G. H. Hammond (*Canada Dept. Agr. Pub. 668 (1940), pp. 18, figs. 12*).

**Parasites of the elm leaf beetle,** S. E. Flanders. (Calif. Citrus Expt. Sta.). (*Trees Mag., 3 (1940), No. 2, p. 14*).

**The clerid Thanasimus lecontei (Wolc.) as a factor in the control of the western pine beetle,** H. L. Person. (U. S. D. A.). (*Jour. Forestry, 38 (1940), No. 5, pp. 390–396, fig. 1*).—The author finds that artificial methods of control of the western pine beetle are only moderately successful at best and always expensive; that biological methods hold considerable promise. The black-bellied clerid *T. lecontei* was found to be the most effective of the predators of this beetle, and methods are given by which the clerid population may be increased.

**Blister beetles and their control,** G. I. Gilbertson and W. R. Horsfall (*South Dakota Sta. Bul. 340 (1940), pp. 23, figs. 11*).—This nontechnical account, which includes life histories, descriptions, damage done by, and control of blister beetles common to South Dakota, treats particularly of the immaculate blister beetle *Macrobasis immaculata* (Say), a striped blister beetle *Epicauta lemniscata* F., the spotted blister beetle, ash-gray blister beetle, shiny black blister beetle *M. murina* Lec., squash blister beetle *Henous confertus* (Say), white-segmented blister beetle *M. segmentata* (Say), and sunflower blister beetle *E. callosa* Lec. They are of importance in the State because of their destructiveness to a wide range of field, garden, and ornamental plants, and because certain species often occur in great hordes overrunning vast acreages. Many of the approximately 35 species found in the State have a wide variety of host plants and are often scattered more or less uniformly over whole sections, while others are limited or have preferred hosts and therefore are concentrated or localized.

A survey of the insect enemies attacking grasshopper egg pods in an 80-acre field in Hand county in 1938 resulted in the finding of 23.7 percent damage by blister beetle larvae, 35.6 by bee fly larvae, 1.7 by hymenopterous parasite *Scelio calopteni* Riley, and 17.8 percent unknown, or a total of 78.8 percent.

The blister beetles are difficult to control since they appear suddenly and often do a large amount of damage before being detected. Although they are not readily

poisoned with ordinary stomach poisons, fluosilicate dusts have been used to advantage, barium fluosilicate being the safest for the crops. A number of proprietary spray compounds are said to have given fair results when applied thoroughly with sufficient pressure.

**The biology and control of the round-headed apple-tree borer (Saperda candida Fabricius)**, A. D. Hess (*New York State Sta. Bul. 688 (1940), pp. 93, figs. 36*).—Studies of the roundheaded apple tree borer in the Champlain Valley and the region of Ithaca, N. Y. extending over a 4-yr. period, are reported in 2 parts, accompanied by 30 references to the literature cited. Part 1 (pp. 6–67) reports upon biological work, the details being given in 13 tables and many charts. The emergence of adults occurs mainly during June, followed by a preoviposition period of less than a week. "Egg laying occurs from the last part of June until the last part of August, reaching a peak around the middle of July. Each female usually deposits 30 to 40 eggs. Eggs hatch in about 2 weeks, the period varying from 10 to 25 days. All eggs have hatched by the middle of September. Most larvae complete their life cycle in 3 yr. Some complete their development in 2 yr., and a few require 4 yr. The length of the pupal period varies with the season from 19 to 30 days. Pupation begins during the last part of April, and most mature larvae have pupated by the end of May. Adults remain in the pupal chamber about 11 days before emerging." Control work is reported upon in part 2 (pp. 67–91) with the details presented in 11 tables and 2 charts. In this work many materials and methods of control were experimented with, 30 chemicals being tested for their injuriousness to apple trees. Among the least injurious were paradichlorobenzene, pyrethrum extract in alcohol, dichloroethyl ether, and a solution of paradichlorobenzene in carbon disulfide. Among the most injurious were ethyl acetate, orthodichlorobenzene, and carbon disulfide.

The investigations have shown that the practice of clean culture greatly facilitates control. The eradication of wild host plants from the vicinity of the orchard is advised. It is recommended that sprays of lead arsenate or cryolite be applied to the foliage of young orchards during June and the first part of July, following the same schedule and spray formula which is applied to older trees. Such sprays gave as high as 95-percent control in experimental orchards. Heavier applications gave as high as 100-percent control.

A new type of injection gun is recommended as the best means of treating trees infested with borers. Dichloroethyl ether, pyrethrum extract in alcohol, rotenone extracts, and a solution of paradichlorobenzene in carbon disulfide are recommended for use in this gun. A paint of calcium cyanide and raw linseed oil is also recommended as giving satisfactory results.

**The influence of temperature, moisture, and food upon the development and survival of the saw-toothed grain beetle**, E. L. Thomas and H. H. Shepard. (Minn. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 9, pp. 605–615, figs. 2*).—In order to secure more definite information on the life history of the saw-toothed grain beetle over a considerable range of controlled conditions relating to temperature, food, and atmospheric moisture, development of all stages of the pest was investigated. "Rearings were made or attempted at temperatures of 15°, 20°, 25°, 30°, 35°, and 40° C., at saturation deficiencies of 5, 12.5, and 22.5 mm., and with rolled oats, English walnuts, and raisins as food. At 5 mm. saturation deficit and on rolled oats as food, the total life cycle from egg to adult requires 69.06 days at 20°, 30.31 days at 25°, 20.67 days at 30°, and 18 days at 35°. With rolled oats as food the developmental optimum appears at 35°, while with walnuts the developmental optimum occurs between 30° and 35°. Eggs and larvae failed to develop at 15° and 40°.

In general, development is more rapid at the higher humidities. The egg and pupal stages appear to be little affected by atmospheric moisture conditions. On the basis of the rate of development, rolled oats are superior to either walnuts or raisins as a food for the saw-toothed grain beetle. Adults of the saw-toothed grain beetle and the confused flour beetle were exposed to high temperatures. At 44° and 30-percent relative humidity 50 percent of the flour beetles were killed in a little over 4 hr., while at 46° and 50-percent relative humidity about 40 min. were required. At 42° 50 percent of the adult saw-toothed grain beetles were killed in 34 hr., while at 44° the exposure periods were approximately 4.5 and 5.7 hr. at 30- and 75-percent relative humidities, respectively. Adult saw-toothed grain beetles exposed at 10° and 2° gave 50-percent mortality values at 30 days and 105 hr., respectively."

A list is given of 16 references to the literature cited.

**Weevils from eggs in raw materials,** D. Costa (*Macaroni Jour., 22 (1940), No. 2, pp. 12, 31, figs. 3*).

**Respiratory metabolism during larval and pupal development of the female honeybee (Apis mellifica L.),** R. M. Melampy and E. R. Willis. (U. S. D. A. and La. State Univ.). (*Physiol. Zool., 12 (1939), No. 3, pp. 302–311, figs. 5*).—The results of studies conducted, presented in tables and graphs, are accompanied by a list of 18 references to the literature cited. In this work measurements of oxygen consumption and carbon dioxide production were made on individual queen and worker bees throughout their larval and pupal development. It was found that "the respiratory rates rise per individual insect during the larval period, fall to a minimum during pupation, and finally rise before emergence. The queen or reproductive caste is characterized by a higher metabolic rate, which is associated with the more rapid growth rate of this caste. Respiratory quotients greater than unity indicate a synthesis of lipid from carbohydrate for both castes during the larval stages. The respiratory quotient for the queen ranges between 0.96 and 0.83 during the pupal stage, whereas that for the worker ranges between 1.05 and 0.94. The average respiratory quotient for the queen during the pupal stage is 0.87, whereas that for the worker is 0.96."

**A comparison of wintering bees versus destroying them in the fall and restocking the hives with package bees in the spring,** J. A. Munro (*North Dakota Sta. Bimo. Bul., 2 (1940), No. 6, pp. 12–16, figs. 4*).—The information presented has led to the conclusion that destruction of the bee colonies in the fall is justified only when it is not possible to provide satisfactory wintering conditions for the bees.

**Wintering bees in Wyoming,** C. H. Gilbert (*Wyoming Sta. Bul. 238 (1940), pp. 15, figs. 5*).—A description is given of the methods of wintering tested, and the findings are outlined and briefly discussed. The experiments conducted show that (1) wintering in yards with protected hives gives better results than wintering in cellars, (2) excellent low cost protection is given by tar paper packing, and (3) individual celotex cases, though more expensive, are very convenient and gave the best results during the 4 yr. of tests.

**The two-queen hive and commercial honey production,** C. H. Gilbert (*Wyoming Sta. Bul. 239 (1940), pp. 15, figs. 5*).—In work at the station, various modifications of the two-queen system were tested, all of which gave increased honey production as compared to single-queen hives. It is pointed out that the increased skilled labor and attention required for manipulation will add to the costs and probably restrict its use in large commercial apiaries.

**Problems encountered in the management of package bees,** W. E. Dunham (*Ohio Sta. Bimo. Bul. 204 (1940), pp. 73–75*).—Information gathered on 984

package bee colonies during a 3-yr. survey of their performance is brought together under the headings of size of package and time of installing, supplying combs or foundation and food, queen losses, and productiveness of package bees v. overwintered colonies. It is concluded that such colonies cannot be depended upon to produce a maximum crop in areas where the bulk of the honey is harvested from alsike clover. In the sweetclover areas of the State, in which the honey flow is late, package bees will produce crops of honey equal to or larger than those produced by overwintered colonies.

**Laying workers, M. H. Haydak.** (Minn. Expt. Sta.). (*Amer. Bee Jour., 80 (1940), No. 4, p. 163*).—A contribution in apiculture.

**A contribution to the knowledge of the Eucharidae (Hymenoptera: Chalcidoidea), A. B. Gahan** (*U. S. Nat. Mus. Proc., 88 (1940), No. 3086, pp. 425–458*).—Descriptions of 13 new species of Eucharidae, all forms of which family are parasites of Formicoidea, are given, accompanied by notes.

**A new species of Encopognathus from California (Hymenoptera: Sphecoidea), P. H. Timberlake.** (Calif. Citrus Expt. Sta.). (*Ent. News, 51 (1940), No. 6, pp. 167, 168*).—*E.* (*Rhectognathus*) *rufiventris*, collected on flowers of *Phacelia distans* near Victorville, is described as new.

**New genera and species of ichneumon-flies, with taxonomic notes, R. A. Cushman** (*U. S. Natl. Mus. Proc., 88 (1940), No. 3083, pp. 355–372, figs. 2*).—Two new genera, *Apotemnus* and *Brachyscleroma*, are erected and nine species are described as new.

**The ichneumon-flies of the subfamily Neorhacodinae, with descriptions of a new genus and three new species, R. A. Cushman** (*U. S. Natl. Mus. Proc., 88 (1940), No. 3088, pp. 523–527, fig. 1*).—A new genus, *Romaniella*, is erected, of which *R. cæsulcatus* n. sp., reared from an old cotton boll at Campinas, São Paulo, Brazil, is the type species, and *Neorhacodes enslini* (Ruschka), *N. longicauda* n. sp. from Colorado, and *N. brevicauda* n. sp. from Arizona are described.

**Telenomus ovivorus (Ashmead), an egg-parasite of the false chinch bug, F. M. Wadley.** (U. S. D. A.). (*Jour. Kans. Ent. Soc., 13 (1940), No. 1, pp. 6, 7*).—Notes are given on *T. ovivorus*, described in 1893 from material reared from eggs of a hemipterous insect collected near Washington, D. C. First observed by the author in 1914, at which time it was reared from the eggs of the false chinch bug at Garden City, Kans., it is concluded that this parasite might be at times a definite check on the increase of the false chinch bug in this region.

**Spiders and insects found associated with sweet corn, with notes on the food and habits of some species.—V, Homoptera and summary, R. T. Everly** (*Ohio Jour. Sci., 40 (1940), No. 3, pp. 143–146*).—This contribution dealing with the Homoptera is the last of a series (E. S. R., 81, p. 674), and presents a list of species of insects and spiders collected within the limits of a 4-acre field of sweet corn at Holmesville, Ohio.

**Bacterium tularense: Its persistence in the tissues of the argasid ticks, Ornithodoros turicata and O. parkeri, G. E. Davis** (*Pub. Health Rpts. [U. S.], 55 (1940), No. 16, pp. 676–680*).—It is shown that this organism may survive for at least "674 and 701 days, respectively, in the tissues of *O. turicata* and *O. parkeri*, but is not transmitted during feeding. The virulence of the organism was not adversely affected by the long period of residence in these ticks nor by the failure of the ticks to receive a blood meal."

**A new species of Taenia from a coyote [T. laruei], P. C. Hamilton.** (Okla. A. and M. Col.). (*Amer. Micros. Soc. Trans., 59 (1940), No. 1, pp. 64–69, figs. 5*).

## ANIMAL PRODUCTION

**[Livestock investigations in Mississippi]** (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 7, pp. 1, 2, 7, 8*).—Results of experiments with livestock are presented in articles entitled Grass Silage and Stack Silos Seem Worthy of Trial, by W. C. Cowsert (pp. 1, 2); Cottonseed Cake Fairly Satisfactory When Used as Principal Concentrate in Ration for Finishing Beef Calves, by A. E. Cullison (pp. 7, 8); Mowing Doubles Palatability, Adds to Protein Content, by H. W. Bennett and R. H. Means (p. 8)); and Blackstrap Molasses About Equals Corn in Livestock Ration, by W. C. Cowsert (p. 8).

**[Livestock investigations in Nebraska]** (*Nebraska Sta. Rpt. [1939], pp. 33–37, 42–44, 56, 57, 59*).—Experiments for which results are briefly reported include sorghum grain v. corn for fattening cattle; comparisons of alfalfa hay, prairie hay, and silage, of rye and corn, and of cottonseed meal and soybean oil meal in winter rations for steer calves; a comparison of protein concentrates in the winter ration of heifer calves; the influence of sorghum grains upon beef quality and upon the quality and palatability of pork; hybrid v. open-pollinated corn for fattening pigs; sorghum grains v. corn for pigs in dry lot and on Sudan grass pasture; soybean oil meal alone v. mixtures of soybean oil meal and tankage or cottonseed meal and tankage as protein supplements for pigs on Sudan grass pasture; the value of sorghum grain, silage, and fodder as feeds for lambs; and sorghum fodder v. native wild hay as a roughage for growing colts.

From experiments with poultry, results are noted on the antirachitic value of ultraviolet irradiation for laying hens; the utilization of protein from various sources by laying hens and by growing poults; a comparison of pulverized oats, feeding-grade oatmeal, and germinated oats in chick rations; the field feeding of grain sorghums to turkeys; and a recommended system of feeding turkeys during the final 6 weeks' finishing period.

**[Livestock investigations in New Hampshire]**, E. G. RITZMAN, R. C. DURGIN, T. B. CHARLES, A. E. TEPPER, S. R. SHIMER, H. A. DAVIS, P. A. WILCOX, C. L. MARTIN, M. S. COVER, C. A. BOTTORFF, W. T. ACKERMAN, G. M. FOULKROD and B. J. FRENCH (*New Hampshire Sta. Bul. 319 (1940), pp. 25, 26, 40, 41, 42, 43, 44*).—Progress reports (E. S. R., 82, p. 228) are presented for investigations on the energy expended by the horse during work, the effect of adding wheat-germ oil to the ration of breeding sheep on the frequency of twinning, the protein requirements of chickens, selective breeding as a control of ruptured egg yolk, the efficiency of gas-burning brooders, controlling moisture in poultry litter, and the relation of vitamin C in the diet to the incidence of ulcerated gizzards in chicks.

**The nutritive values of some forage crops of Puerto Rico.—III, Grasses, legumes, and mixtures**, J. H. AXTMAYER, G. RIVERA HERNÁNDEZ, D. H. COOK, ET AL. (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 24 (1940), No. 1, pp. 3–31*).—In a further report of this series of investigations (E. S. R., 81, p. 255), data are presented on the results of 17 digestion trials with sheep, measuring the digestibility and the biological value of the protein when fed as a sole ration of cowpeas (three stages of maturity), Merker grass, yaragua grass, alfalfa hay, and malojilla grass; mixtures of Merker grass and pigeonpea and of malojilla grass and pigeonpeas; and a low-protein synthetic diet plus Merker grass straw. In general, the biological value of proteins was higher for the grasses than for the legumes. The grasses ranked in order of descending net-protein values as follows: Guinea, Merker, Para, elephant, Guatemala, and yaragua, the last-named having a very wide nutritive ratio due

to its low digestible-protein content. The biological value of the protein in cowpeas progressively increased as the plant passed from the blooming stage to the full-pod stage. Alfalfa yielded more total digestible nutrients than any of the other legumes studied. Samples of the various herbages dried in the laboratory varied in vitamin A content from 33 Sherman units per gram in yaragua grass to 200 units per gram for immature velvetbeans or soybeans.

**Chemical analyses of grasses**, J. H. Axtmayer, G. Rivera Hernández, D. H. Cook, et al. (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 24 (1940), No. 1, pp. 32–39*).—Data are presented on the chemical composition of 83 grasses calculated on the wet and dry basis and the results discussed from the nutritional point of view.

**Legumes, grasses, and cereal crops for silage**, A. C. Ragsdale and H. A. Herman (*Missouri Sta. Cir. 209 (1940), pp. 10, figs. 3*).—The discussion deals with the advantages of legumes, grasses, and cereal crops for silage; crops suitable for grass silage purposes; proper stage for harvesting; methods of harvesting and ensiling; the use of preservatives, including molasses, the A. I. V. method, and phosphoric acid; and the feeding of such silages.

**Biochemical and nutritional studies of dehydrated sweet potato**, E. J. Lease and J. H. Mitchell (*South Carolina Sta. Bul. 329 (1940), pp. 15, figs. 2*).—Raw sweetpotatoes (68 percent moisture) were found to contain an average of 40 μg. of carotene per gram, while sweetpotato flour contained 130 μg. On a dry-matter basis the sweetpotatoes contained an average of 4.3 percent crude protein and 91.21 percent nitrogen-free extract.

In a feeding experiment, dairy cows maintained on a vitamin A-deficient ration until their milk contained very little carotene or vitamin A were then changed to a ration containing 25 percent sweetpotato meal as a substitute for white corn in the concentrate mixture. Under this feeding regime the carotene content of the milk steadily increased. The sweetpotato meal also proved palatable and nutritious for dairy calves. When fed to one calf as the only source of vitamin A and administered in skim milk, the calf grew well and stored vitamin A in its liver.

When laying hens received a ration containing 25 percent of the meal after having been on a vitamin A-low diet for 6 weeks, the vitamin A potency of the egg yolks increased from 8 to 42 blue units per gram. Day-old chicks receiving a vitamin A-low basal ration plus 50 percent sweetpotato flour stored more vitamin A in their livers than control birds receiving 1 percent cod-liver oil as a supplement to the basal diet.

Suggestions are offered regarding the use of sweetpotato flour in recipes for human use, devised by E. Mishler. Analyses of the carotene content of the flour and in baked products prepared from it are included.

**Prevention of nutritional muscular dystrophy in suckling E-low rats with alpha-tocopherol and related substances**, H. M. Evans and G. A. Emerson. (Univ. Calif. et al.). (*Soc. Expt. Biol. and Med. Proc., 44 (1940), No. 2, pp. 636–639*).—Muscular dystrophy consistently developed in suckling young rats when the mothers were maintained on a vitamin E-low diet throughout the gestation and lactation periods. The administration of 6 mg. of α-tocopherol to the mothers on the day of littering largely prevented the onset of this disorder, and 10 mg. entirely prevented it. Also direct administration of 1 mg. daily of α-tocopherol to the young rat after the tenth day or 3 mg. daily after the fifteenth day prevented this disorder, but the young receiving α-tocopherol after the eighteenth day were not protected. Four compounds related chemically to α-tocopherol were tested for antidystrophic activity and found to be inactive

**The plane of intake of beef muscle protein as affecting the energy and the nitrogen metabolism of the mature albino rat,** E. B. FORBES, A. BLACK, E. J. THACKER, and R. W. SWIFT. (Pa. Expt. Sta.). (*Jour. Nutr., 20 (1940), No. 1, pp. 47–58*).—Continuing this line of investigation (E. S. R., 82, p. 229), mature rats were fed equicaloric diets containing 10, 25, and 45 percent protein, respectively, over 70-day balance experiments. Practical equilibrium of live weight and nitrogen content of the body was maintained. The digestibility of the dietary protein increased in the order of the increase in protein of the diets. Digested nitrogen and urinary nitrogen were similar in value. The metabolizable energy and also heat production diminished in the order of increasing protein contents of the diets, the diminishing heat production being equivalent to a slightly increasing heat production in relation to the metabolizable energy. Urinary nitrogen per calorie of urinary energy increased as the level of dietary protein increased.

**H ion concentration of various fluids of the genital tract of the cow,** H. A. LARDY, W. D. POUNDEN, and P. H. PHILLIPS. (Univ. Wis.). (*Soc. Expt. Biol. and Med. Proc., 44 (1940), No. 2, pp. 517–519*).—The following pH values were found to exist for genital secretions of the cow: Vaginal fluid (anoestrous) 6.4, cervical fluid 8.33, uterine fluid 6.8, amniotic fluid from calf fetus 7.12, and follicular fluid 7.6.

**Studies on the bovine electrocardiogram, I, II.** (Mich. Expt. Sta.) (*Soc. Expt. Biol. and Med. Proc., 43 (1940), No. 3, pp. 575–584, figs. 3*).—Two reports of this study are noted.

I. *Electrocardiographic changes in calves on low potassium rations*, J. F. Sykes and B. V. Alfredson (pp. 575–579).—Four experimental calves used in this study were placed on a semipurified diet containing from 0.1 to 0.12 percent potassium at 160 days of age. After extended periods on this ration the serum potassium values declined to approximately one-half normal levels in all cases. Increasing the potassium intake resulted in restoration of normal serum potassium levels which were then retained despite later reduction of potassium intake. Electrocardiograms made at frequent intervals revealed marked changes in three of the experimental animals, characterized chiefly by a pronounced increase in the duration of the QRS complex and accompanied by striking changes in its contour and voltage. The intervals were approximately twice as long as those displayed by the electrocardiograms of control calves and of other normal animals. This condition persisted among the experimental calves despite the restoration of serum potassium values to normal levels.

II. *Bundle branch block*, B. V. Alfredson and J. F. Sykes (pp. 580-584).—Employing an operative technic as described, section of right and left branches of the His bundle to produce bundle branch block was successfully carried out in 14 calves and 10 dogs. Electrocardiograms of these animals revealed that changes in duration and form of QRS after bundle branch block are much less pronounced in calves than in dogs. The difference between these two species is attributed to differences in the distribution of the intraventricular conducting system.

**The utilization of certain feeding stuffs by cattle,** E. B. FORBES, J. W. BRATZLER, and C. E. FRENCH (*Pennsylvania Sta. Bul. 391 (1940), pp. [2]+14*).—In trials with steers involving 18-day experimental periods for the collection of urine and feces, determinations were made of the digestibility and metabolizable energy for the following feedstuffs: Silages from alfalfa, soybean herbage, and clover-timothy mixture, each preserved with molasses and with phosphoric acid; finely cut corn stover; gluten feed; and soybean oil meal made by the hydraulic, solvent, and expeller processes. Calcium and phosphorus balances

were also determined on the silage rations. The digestible crude protein values were higher for the acid than for the molasses silages, but the total digestible nutrient and metabolizable energy values of the molasses silages were materially higher than the corresponding values for the phosphoric acid lots. The digestibility of corn stover, especially its crude protein and ether extract, was much lower than as compiled by Morrison, as were the dry matter, ether extract, and crude fiber of gluten feed. The three soybean oil meals were similar in digestibility, the solvent-processed meal having slightly higher crude protein and lower total digestible nutrients and metabolizable energy values than the other two. Calcium and phosphorus balances on the silage rations were generally positive.

**Rations for fattening cattle in Arizona,** E. B. STANLEY and A. H. WALKER (*Arizona Sta. Bul. 170 (1940), pp. [2]+135–155*).—A summary of the results of a series of feeding trials with good-quality range-raised yearling steers is presented. The variety of rations included in these trials afforded an opportunity to compare the value of numerous feeding stuffs for steer fattening. No. 2 alfalfa hay proved to be practically equal to No. 1 alfalfa and worth only slightly more than No. 3 alfalfa. No advantage in grinding alfalfa was apparent. When hegari silage was evaluated at $3.50 per ton, hegari fodder and cottonseed hulls were worth $9.75 and $5.73 per ton, respectively, when supplemented with cottonseed meal. When fed without silage whole cottonseed was equal to cottonseed meal, but with silage the seed proved somewhat inferior to the meal. When fed in combination with alfalfa hay, barley, and cottonseed meal, hegari silage was worth approximately 50 percent the value of alfalfa hay. Ground barley was worth as much as cottonseed meal when replacing part of the meal in alfalfa hay-hegari silage ration. Cottonseed meal was equal in value to meat or fish meal when fed at the same protein level as supplements to hay, silage, and barley. Calves made somewhat more efficient gains than yearlings, but yearlings utilized a larger percentage of roughage in their ration than calves.

**Beef cattle feeding trials in Hawaii,** A. L. HENKE, S. H. WORK, and A. W. BURT (*Hawaii Sta. Bul. 85 (1940), pp. 37, pls. 6*).—In addition to presenting a brief history of the beef cattle industry in Hawaii, the authors summarize results of eight beef cattle fattening trials. A single fattening trial with Aberdeen Angus steers showed that over a period of 126 days a ration of cane molasses, pigeonpea meal, and corn-cob-and-husk meal supported average daily gains of 2.46 lb., with an average requirement of 10.2 lb. of the mixture per pound of gain. Similarly, steers fed a mixture of pineapple bran, cane molasses, cane bagasse, and soybean-oil-cake meal for 133 days made average daily gains of 1.39 lb. and required 15.2 lb. of concentrate per pound of gain. The ration composed of pineapple bran and cane molasses in 5:3, 4:4, and 3:5 ratios, supplemented with 20 percent soybean-oil-cake meal in each instance, promoted satisfactory gains in steers (4:4 mixture most effective) but was less economical than pasturing steers on koa haole with supplementary cane molasses. Two experiments gave evidence that pigeonpea pasture was superior to improved grass pasture for fattening steers, both from the standpoint of average daily gain and quantity of beef produced per unit area. Supplementing either type of pasture with cane molasses increased the rate of gain and improved the carcass quality. Molasses had a calculated value of about $13 per ton as a supplement to pigeonpea pasture and from $8.90 to $10.77 per ton as a supplement to grass pasture. Similarly, in three trials it was found that molasses was a desirable supplement to koa-haole pastures, having a calculated average value of $12.57 per ton.

**Lamb feeding tests, designed for study of urinary calculi, also compare rations,** I. WATSON (*Colo. Farm Bul. [Colorado Sta.], 2 (1940), No. 3, pp. 16,*

*17*).—Twenty different rations were compared in feeding tests of 125–140 days' duration with 25 lambs on each ration. Alfalfa was fed as a roughage in 5 of the rations, cane fodder in 14, and beet tops in 1. Corn proved somewhat more efficient as a supplement to alfalfa than wheat, barley, millet, or milo, although similar gains were made on all 5 rations. Barley and milo were much inferior to the other 3 grains when fed with bran and cane fodder. The addition of small amounts of lime or of bonemeal to the cane fodder rations proved desirable. The cheapest and most efficient gains were secured on a ration of white corn, "C" beet molasses, and beet tops. The total gains obtained on this ration were only slightly below those on the alfalfa-grain rations.

**Soybean oilmeal for growing lambs**, T. B. Keith, R. C. Miller, and W. L. Henning (*Pennsylvania Sta. Bul. 397* (*1940*), *pp.* [*2*]+*18*, *figs. 3*).—Using red clover or mixed timothy-clover hays, corn, and soybean oil meal as basic feedstuffs, the authors conducted 6 experiments involving 66 pairs of lambs to determine the optimum amount of soybean oil meal for feeding growing lambs. In 3 experiments in which the ratio of concentrate to hay was not controlled but averaged 1:1.3, a supplement of 5 percent soybean oil meal increased the rate and efficiency of gain over that on corn alone when red clover hay was fed, but with mixed timothy-clover hay neither 5 nor 10 percent soybean oil meal in the ration gave significantly better results than corn alone. In the three later experiments lambs received concentrates and red clover hay in the definite ratios of 3:2, 1:1, and 2:3, respectively, with 35 percent and 10 percent soybean oil meal being fed at each concentrate-to-hay ratio. All lambs receiving 35 parts soybean oil meal and 64 parts corn gained 15 percent more rapidly and required 13 percent less feed per unit of gain than those receiving 10 parts soybean oil meal and 89 parts corn. All lambs fed at the 3:2 concentrate-to-hay ratio required 19 and 74 percent less feed per unit of gain than those fed at the 1:1 and 2:3 ratios, respectively. The ration composed of soybean oil meal and corn (35:64) and fed at the concentrate-to-hay ratio of 3:2 (total ration, 17 percent protein) promoted the most economical gains in lambs regardless of feed prices. Those receiving the above concentrate mixture and red clover hay made the most economical gains regardless of the concentrate-to-hay ratio.

**Purebred and crossbred pigs: Comparison of rate of growth and economy of gains**, F. B. Headley. (Coop. U. S. D. A.). (*Nevada Sta. Bul. 153* (*1940*), *pp 9*, *figs. 2*).—Based on the results of four feeding experiments, each comparing the rate and efficiency of gain of purebred Duroc-Jersey pigs and crossbred (Duroc-Jersey male × Poland China female) pigs, it was found that the crossbred pigs on the average made 100 lb. gain in 4 days less time and on 22 lb. less of the concentrate mixture than the purebred pigs. The results were essentially the same in experiments I and III, in which individual feeding was practiced, and II and IV, in which the pigs were fed as groups.

**Protein and vitamin supplements for growing and fattening pigs**, J. P. Willman and F. B. Morrison ([*New York*] *Cornell Sta. Bul. 730* (*1940*), *pp. 45*).—The results of four series of experiments are summarized. Six trials comparing tankage, menhaden fish meal, and whitefish meal as supplements to shelled corn, linseed meal, ground alfalfa hay, and minerals for fall pigs in dry lot gave for these supplements average daily gains of 1.53, 1.6, and 1.57 lb., and feed required per 100 lb. of gain, 371.5, 376.8, and 369.4 lb., respectively. In a seventh trial, not included in the average, in which pigs had free choice of corn and the trial mixture, the whitefish meal gave very unsatisfactory results. In four trials comparing tankage and fish meals as supplements for pigs having access to rape and oats pasture and in which pigs had free choice of corn and supplement mixture, the following average results were obtained: Average daily gains,

1.23, 1.34, 1.42, and 1.33 lb.; and feed required per 100 lb. of gain, 357.4, 336.1, 331.8, and 336.5 lb. for tankage and linseed meal, menhaden fish meal and linseed meal, whitefish meal and linseed meal, and menhaden fish meal alone, respectively. Results of three trials gave evidence that the inclusion of either 1 or 2.5 percent cereal yeast fed as a supplement to ground corn and the trial mixture for pigs in dry lot did not influence materially either the rate of gain or feed required per unit of gain. Likewise, the inclusion of 0.5 lb. of cod-liver oil or 0.125 lb. of fortified cod-liver oil per 100 lb. of the basal concentrate mixture did not significantly influence the rate of gain of pigs in dry lot. The cod-liver oil supplements increased the cost of gain and hence were not economical.

**The nutrition of the bacon pig.—V, The minimum level of protein intake consistent with quick growth and satisfactory carcass quality,** H. E. Woodman and R. E. Evans (*Jour. Agr. Sci. [England], 30 (1940), No. 1, pp. 83–97*).—Continuing this series of investigations (E. S. R., 82, p. 524), an experiment was conducted similar to that described in part 3, except that whitefish meal replaced the mixture of protein concentrates in the ration until the pigs weighed 150 lb., after which soybean oil meal was substituted. The high-protein group received 12, 10, and 5 percent protein and the low-protein group 5, 4, and 3 percent protein during growth stages (1) up to 90 lb., (2) 90–150 lb., and (3) 150–200 lb., respectively. A third group of pigs allowed the lower levels of protein received the protein concentrate mixture used in the former trial. The conclusions of the previous trial were completely confirmed by this experiment. The biological efficiency of the protein in the fish meal was at least as high as that of the combined proteins in the concentrate mixture. However, when fed at the upper level it exerted a slight softening effect on the carcass fat.

**An investigation on the alleged toxicity of cod-liver oil for pigs,** N. J. Scorgie and W. C. Miller (*Empire Jour. Expt. Agr., 7 (1939), No. 28, pp. 357–368*).—To secure information on the possible toxicity of cod-liver oil for pigs experiments were conducted in which 10 pigs received high, medium, and low grades of cod-liver oil in excessive amounts ranging from 2 to 8.3 percent of the ration. Four control pigs received no oil and two pigs an equivalent amount of olive oil. All pigs made similar live weight gains, and those receiving cod-liver oil appeared fully as healthy as the control animals. Post-mortem examinations revealed that the livers, heart, and kidneys of pigs fed cod-liver oil were normal in appearance and weight, indicating that cod-liver oil is not a factor in the causation of toxic liver dystrophy, even when fed in excessive amounts.

**The calcium, inorganic phosphorus, and magnesium content of the blood serum of young horses,** C. T. Blunn, C. E. Howell, and R. W. Caldwell. (Univ. Calif.). (*Jour. Nutr., 20 (1940), No. 1, pp. 1–6*).—Calcium, inorganic phosphorus, and magnesium determinations on the blood serum of foals ranging from birth to 23 mo. of age indicated that the calcium and magnesium contents in the blood of young colts were essentially the same as those reported for adult animals. The inorganic phosphorus content of the foal's serum at birth was higher than that of the dam. A rapid rise in inorganic phosphorus to 2 weeks of age was noted, followed by a further increase to a maximum at about 10 weeks of age. After this age inorganic phosphorus gradually declined as the animals became older.

***Relief of hypochromic anemia in dogs with synthetic vitamin $B_6$: Influence of "filtrate factors,"*** H. J. Borson and S. R. Mettier. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 43 (1940), No. 3, pp. 429–432*).—Dogs maintained on a purified diet of washed casein, sucrose, cottonseed oil, lard, cod-liver oil, bone ash, and salt mixture, and supplemented with known members of the vitamin B complex other than vitamin $B_6$, consistently developed hypochromic

microcytic anemia. The administration of either natural or synthetic vitamin $B_6$ at the rate of 60 μg. per kilogram live weight daily alleviated the anemia. An adequate supply of the nonadsorbable filtrate factors in the diet was found to be necessary for the complete disappearance of this anemia.

**Studies on the metabolism of fowls.—II, The effect of activity on metabolism,** T. Deighton and J. C. D. Hutchinson (*Jour. Agr. Sci.* [*England*], *30* (*1940*), *No. 1, pp. 141–157, figs. 3*).—Continuing this series of reports (E. S. R., 82, p. 807), results of a series of metabolism tests with Light Sussex cockerels are presented. When the results were reduced to a basis of zero activity by a system of "point scores" as described, a diurnal rhythm in metabolism during fasting was found to occur, morning observations averaging about 9 percent higher than evening observations. The metabolism in the standing position averaged about 40–45 percent above that in the sitting position, while at the moment of rising the heat production may be trebled. The application of these findings to the estimation of food requirements of fowls is discussed.

**Observations on the mineral metabolism of pullets, IV,** R. H. Common (*Jour. Agr. Sci.* [*England*], *30* (*1940*), *No. 1, pp. 113–131*).—Continuing these investigations (E. S. R., 80, p. 671), experiments were conducted to determine the nature of the calcium and phosphorus combinations present in the droppings of pullets and the extent to which phytic acid present in the ration may be recovered from the droppings. It appeared that phytic acid in rations based on cereals was incompletely hydrolyzed during its passage through the digestive tract, since a considerable portion was recovered in the droppings even when the ration contained no calcium supplement. The supplements of calcium carbonate or tricalcium phosphate, particularly the former, greatly increased the percentage recovery of phytic acid in the droppings. Recovery of phytic acid was higher in laying birds than in nonlaying birds. The relationship of these findings to those of Knowles et al. (E. S. R., 71, p. 86) is discussed.

**Studies of calcium and phosphorus metabolism in relation to the chemical structure of bone.—I, Experiments with laying birds,** C. Tyler (*Biochem. Jour.*, *34* (*1940*), *No. 2, pp. 202–212, figs. 3*).—Continuous calcium and phosphorus trials were conducted over 35-day periods with laying pullets which received in addition to a low-calcium basal diet supplements of either calcium carbonate, calcium sulfate, or calcium gluconate. From data obtained in the balance studies values for the calcium as calcium phosphate and as residual calcium of the bone gained or lost each day were calculated. It appeared that the residual calcium was chiefly concerned in egg laying, since there was generally quite a large gain in residual calcium on nonlaying days and quite large losses on laying days. The calcium as calcium phosphate fluctuated slightly from day to day, but showed a trend toward a loss over the entire period. A highly significant reciprocal relationship was found to exist between the calcium of calcium phosphate and the residual calcium of the bone. The implications of this relationship are discussed.

**Micromelia in adult fowl caused by manganese deficiency during embryonic development,** C. D. Caskey and L. C. Norris. (Cornell Univ.). (*Soc. Expt. Biol. and Med. Proc.*, *44* (*1940*), *No. 2, pp. 332–335, fig. 1*).—A group of chicks, hatched from eggs of hens fed a low-manganese diet, which were ataxic and most of which were also micromelic were reared on well-balanced diets adequately supplemented with manganese. Most of the birds attained maturity and were continued on experiment to about 16 mo. of age. Chicks which were micromelic at the time of hatching failed to show any apparent recovery from this condition. Comparative measurements of six normal

and six micromelic mature females of approximately the same age and weight showed that in micromelia the sternum was not affected and the metacarpus only slightly shortened, but that the femur, tibia, humerus, ulna, radius, and tarsometatarsus were significantly shorter. Also the consumption of a diet adequate in manganese did not promote recovery from the brachycephalism.

**Identification of the rice factor.** (Univ. Calif. et al.). (*Jour. Biol. Chem.*, *134 (1940), No. 1, pp. 213–216; 465, 466; 135 (1940), No. 1, pp. 355, 356*).—Efforts by H. J. Almquist, E. L. R. Stokstad, E. Mecchi, and P. D. V. Manning to identify the principle in polished rice not present in dried yeast which has a growth-promoting effect on chicks revealed that the rice factor can be identified with, or at least replaced by, a mixture of glycine and chondroitin. Each proved to be a distinct growth factor for chicks. A casein basal diet low in both glycine and chondroitin permitted little or no increase of growth when either was added alone, but when sources of both were added growth was markedly accelerated.

Studies by Almquist, Mecchi, Stokstad, and Manning on the role of chondroitin indicated that its glucuronic acid component is similarly growth-promoting, while its galactosamine component appeared to be unessential, if not detrimental. Other substances, including sodium alginate, gum arabic, and certain pentoses, also possessed growth-promoting qualities, indicating that several substances related to glucuronic acid may also be active.

Studies by Almquist and Mecchi on the essential nature of glycine for the chick gave evidence that the presence of creatine in the ration is even more effective than glycine in promoting growth. Likewise, sodium or ammonium acetate successfully replaced glycine in the basal diet, but glycolic acid, betaine, guanidine, β-alanine, and choline proved to be ineffective or detrimental supplements. It is suggested that glycine or the acetates are used in the synthesis of creatine or that insufficient supplies result in creatine deficiency of sufficient magnitude to retard chick growth.

**Generalized edema in chicks prevented by d,l-alpha tocopherol,** H. R. Bird and T. G. Culton. (Md. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 44 (1940), No. 2, pp. 543–547, fig. 1*).—In experiments to determine the nutritive completeness of different samples of dried skim milk for chicks, it was observed that a large percentage of chicks fed a simplified diet of dried skim milk, dextrinized cornstarch, cod-liver oil, and mineral mixture developed a generalized edema resulting in death. The most consistent post-mortem condition was edema of the heart and pericardium. This disorder, which was never observed in chicks fed a practical ration, was prevented by the administration in cod-liver oil of *dl-α*-tocopherol.

**Investigations of the cause and prevention of perosis,** R. Penquite, V. G. Heller, and R. B. Thompson (*Oklahoma Sta. Bul. 243 (1940), pp. 18, figs. 4*).—When a basal ration consisting of yellow corn (66 percent by weight), wheat gray shorts (5), alfalfa leaf meal (3), dried buttermilk (15), meat and bone scraps (5), bone meal (5), cod-liver oil (0.25), and common salt (0.75 percent) was fed to young chicks, perosis developed in from 76 to 100 percent of the cases. The addition of ether, alcohol, and water extracts of the basal ration or water extracts of wheat bran, wheat shorts, wheat embryo, and alfalfa to the basal ration did not prevent the incidence of perosis. However, a drinking solution consisting of a water extract of rice bran was highly effective in preventing this disorder, as was the addition of the ash of 70 lb. of rice bran to 100 lb. of the basic ration. The growth of chicks receiving rice bran extract was above normal, indicating that rapidly growing chicks are not necessarily more susceptible to perosis than more slowly growing ones. Numerous other supplements

were added to the basal ration, with varying degrees of success. The addition of small amounts of manganese salts was highly effective, and a correlation appeared to exist between the manganese content of other supplements and their protective properties. However, the addition of an excessive amount of manganese in the form of 1 percent manganese carbonate in the diet decreased viability and growth of the chicks. Substituting casein for meat and bone scraps and bone meal in the basal diet practically eliminated the incidence of perosis, although the manganese contents of the two diets were similar. The manganese required to prevent perosis was shown to vary markedly with the breed of chicks and with the amount of other minerals in the diet. The administration of phosphorus subcutaneously was just as productive of perosis as when given orally. The addition of a calcium supplement markedly reduced the inorganic phosphorus content of the blood of chicks.

**Prevention of perosis by choline,** T. H. JUKES. (Univ. Calif.). (*Jour. Biol. Chem., 134 (1940), No. 2, pp. 789, 790*).—When a basal diet of yellow corn meal, dried skim milk, washed casein, alfalfa meal, mineral mixture, and fish-oil blend was fed to baby turkeys perosis occurred in a high percentage of cases, even in the presence of a manganese supplement. The addition of thiamin, riboflavin, or nicotinic acid to the diet had little effect in retarding the incidence of perosis, but the addition of choline chloride to the diet entirely prevented the occurrence of this disorder. The addition of 0.3 percent of choline to a simplified perosis-producing diet also was effective in preventing perosis in turkeys. Choline also promoted growth on the simplified diet.

**An improved ration for starting ring-necked pheasants,** W. C. SKOGLUND (*Pennsylvania Sta. Bul. 389 (1940), pp. [2]+22, figs. 4*).—Ten starting rations varying mainly with respect to the protein content of the meat scrap used and the levels of meat scrap, white fish meal, and soybean oil meal incorporated in the mixture were compared. A group of 100 ring-necked pheasant chicks was reared in colony brooder houses on each of the experimental rations, and, in addition, 8 check lots of 25 chicks each were reared in electric battery brooders. Variations in the levels of animal protein and soybean oil meal resulted in a rather wide range of calcium and phosphorus contents and calcium: phosphorus ratios in these rations. Data are presented on the growth rate, mortality, and occurrence of perosis on the different rations. A mixture containing about 11 percent meat scrap (50 percent protein), 2.7 percent white fish meal, and 19.5 percent soybean oil meal in addition to the basic ingredients, corn, wheat bran, wheat flour middlings, ground oats, dried skim milk, alfalfa leaf meal, salt, and cod-liver oil, gave the most satisfactory results both from the biological standpoint and on the basis of economy. The incidence of perosis was markedly higher on those rations containing relatively high levels of animal protein and little or no soybean oil meal than on the ration described above.

## DAIRY FARMING—DAIRYING

**[Expriments with dairy cattle and dairy products in Massachusetts]** (*Massachusetts Sta. Bul. 369 (1940), pp. 18, 19, 42–44, 75*).—Reports of animal nutrition investigations, by J. G. Archibald, C. H. Parsons, C. R. Fellers, K. G. Shea, and W. B. Esselen, include the effect of complex mineral and vitamin mixtures on milk production, general health, and reproductive efficiency in dairy cattle; the effect of supplemental iron in the dairy ration on the iron content of milk; the preparation and utilization of legume and grass silage; and the vitamin D and riboflavin activity of cacao shell meal.

From studies with dairy products by W. S. Mueller, M. J. Mack, J. H. Frandsen, M. Glickstein, and M. A. Widland, results are noted on the value of various antioxidants in improving the flavor and keeping quality of milk and some of its products, the effect of aging treatments on gelatin and other ice cream stabilizers, the use of egg solids in ice cream, sodium alginate as a stabilizer for ice cream, the utilization of whey byproducts, and the efficiency and practicability of the paper milk bottle.

**[Investigations with dairy cattle and their products in Nebraska].** (Partly coop. N. J. Expt. Stas. et al.). (*Nebraska Sta. Rpt. [1939], pp. 38, 39, 40–42*).—Included are brief reports on the value of sorghum grain as a substitute for corn in the ration of milking cows, hormones of the pituitary gland and their relation to milk secretion, the semen and spermatozoa characteristics of individual dairy bulls, certain factors involved in the spread of mastitis infection, and the preparation and preservation of condensed skim milks and their use in ice cream manufacture.

**[Investigations with dairy cattle and dairy products in New Hampshire],** E. G. Ritzman, J. W. M. Bunker, M. O. Lee, H. C. Moore, and K. S. Morrow (*New Hampshire Sta. Bul. 319 (1940), pp. 24, 25, 31–33*).—Progress reports (E. S. R., 82, p. 239) are presented for studies dealing with the metabolism of dairy cattle during growth, dry-feed systems of raising dairy calves, and factors affecting the variability in milk solids-not-fat.

**Does sprouting increase the nutritional value of grain?** S. Bartlett (*Empire Jour. Expt. Agr., 7 (1939), No. 27, pp. 244–250*).—Experiments at the National Institute for Research in Dairying comparing sprouted corn and dried corn grain for milking cows and growing dairy heifers indicated that sprouting does not improve the nutritive properties of corn. A brief résumé of the literature is included.

**Bone meal versus no bone meal: Results of a long-time feeding experiment with a dairy ration consisting of timothy hay, corn silage, and concentrates,** S. I. Bechdel, P. S. Williams, J. F. Shigley, and A. A. Borland (*Pennsylvania Sta. Bul. 395 (1940), pp. [2]+12, fig. 1*).—In a test extending from December 1930 to July 1938, the basal ration was compared with the same ration plus 2 percent bone meal. All animals in the experiment had access to good pasture in season. Thirty-three animals used in this trial completed a total of 117 lactation periods, with 23 of the cows completing 1 or more of the lactations on each of the rations. The average daily milk production for those animals completing lactations on each ration was identical on the 2 rations, and the total milk production for the bone meal group was only slightly higher than the control lot. Records on weight and health of calves and number of services required per conception showed only a slight advantage in favor of the bone meal-fed group. Blood calcium and phosphorus values were normal on all cows, although averaging slightly higher for the bone meal group. It is concluded that no outstanding deficiency of minerals resulted under the prevailing conditions when no bone meal was fed.

**The carotene content of several herbages during the growing season,** W. W. Snyder and L. A. Moore. (Mich. Expt. Sta.). (*Jour. Dairy Sci., 23 (1940), No. 5, pp. 363–371*).—Data are presented on the carotene content of seven herbages, including alfalfa, bromegrass, corn leaves, the oat plant, the soybean plant, Sudan grass, and sweetclover, at intervals throughout the growing season. An enormous range in carotene values is recorded, extending from 646.1 μg. of carotene per gram of dry matter in green corn leaves to 7.9 μg. in dry soybean stalks. In general, the carotene content was much greater during the early growth stages than at the stage of maturity at which the plants are usually

harvested. The decline tended to occur at a progressive rate as the plants approached maturity. The importance of harvesting plants at an early stage of maturity in order to obtain the greatest carotene content is stressed.

**The effect of feeding pea vine silage on the carotene and vitamin A content of milk,** B. C. Johnson and W. H. Peterson. (Wis. Expt. Sta.). (*Jour. Dairy Sci., 23 (1940), No. 5, pp. 385–389, fig. 1*).—A study of the milk production and the vitamin A potency of the butterfat of a herd of cows alternately receiving a ration including 25 lb. of pea vine silage preserved with phosphoric acid and a dry ration in which alfalfa hay replaced the pea vine silage gave evidence that the milk produced on the silage ration was markedly higher in carotene and vitamin A than that produced on the dry ration. The level of milk production was also maintained more satisfactorily on the silage than on the dry ration. The vitamin A potency of the milk dropped rapidly when silage was omitted from the ration. After the restoration of silage feeding the vitamin A potency increased to approximately the same level as that of milk from cows fed the silage continuously.

**Improvement in milk production thru breeding,** A. C. Dahlberg (*Farm Res. [New York State Sta.], 6 (1940), No. 3, pp. 14, 16, fig. 1*).—A report of the improvement in the type and milk-producing ability of a Holstein herd brought about by the continuous use of good sires on mediocre foundation animals.

**Reproductive efficiency in dairy cattle,** F. E. Hull, W. W. Dimock, F. Ely, and H. B. Morrison (*Kentucky Sta. Bul. 402 (1940), pp. 159–188*).—A summary of the breeding record of the station dairy herd from 1900 to 1940. Considering a 12-mo. calving interval as ideal, that is, 100 percent breeding efficiency, over a 28-yr. period (1900 to 1928) when no organized program of disease control except for tuberculosis was in effect, the average reproductive efficiency was found to be 69.8 percent. By the continuous application of intensive health measures, a carefully planned mating program, and added attention to nutritional and genetic influences, this herd has been freed from disease so that in 1939 the breeding efficiency was 94.5 percent.

**Extreme rarity of cancer in the cow's udder: A negative finding of vital interest to the dairy industry and to the consumer,** W. W. Swett, C. A. Matthews, and R. R. Graves. (U. S. D. A.). (*Jour. Dairy Sci., 23 (1940), No. 5, pp. 437–446, figs. 4*).—A detailed examination of gross sections of the udders of 313 cows of lactating age and of 105 heifers and freemartins failed to reveal a single case of cancerous growth. This paper describes unusual lesions of the udder encountered in the course of this study. A brief review of the literature confirms the findings that cows are rarely susceptible to mammary cancer.

**The coagulation temperature of milk as affected by pH, salts, evaporation, and previous heat treatment,** P. G. Miller and H. H. Sommer. (Univ. Wis.). (*Jour. Dairy Sci., 23 (1940), No. 5, pp. 405–421, figs. 8*).—The method employed for measuring coagulation consisted in sealing the milk in small glass tubes and subjecting them to a rocking motion in an oil bath. The milk came up to the temperature of the bath in less than 2 min., and coagulation time could be detected by noting the flow of the milk. For each sample a series of subsamples ranging from pH 5.0–6.8 was studied. The coagulation of normal skim milk was very sensitive to pH changes within two pH zones from approximately pH 6.4–6.2, and to a lesser extent between pH 5.4–5.2. Maximum coagulation temperature of milk at the higher pH levels was above 152° C. The presence of phosphate displaced the curve into the more stable regions at pH values below 6.4, whereas calcium had the opposite effect. The effect of added salts at pH above 6.4 depended upon the milk in question. Concentrating and preheating milks displaced the coagulation curve in the same general manner, although concentrat-

ing had a much greater effect than heating alone. Added salts affected heated and concentrated milks in much the same manner as the original milk. The pH of milk tended to decrease with increased temperatures. The presence of calcium increased and that of phosphate decreased the effect of temperature changes.

**The dissolved gases in milk and dye reduction,** J. M. Frayer (*Vermont Sta. Bul. 461 (1940), pp. 32*).—Employing a modified Van Slyke-Neill method for quantitatively measuring the carbon dioxide, oxygen, and residual gases in milk, a study was made of the dissolved gases in milk as affected by sunlight, metabolic activity, evacuation, and processing in an effort to determine the relationship of these factors to the reduction of methylene blue and resazurin in milk. Milk as drawn from the udder contained some oxygen and on exposure to air gained in oxygen and nitrogen while losing carbon dioxide. As bacterial growth increased, both oxygen content and the reduction time of the milk decreased. The point at which fading of methylene blue was first observed correlated closely with that at which reduction of resazurin to full pink occurred. Both occurred when oxygen was low, usually below 0.045 volume percentage, although this level was usually reached some little time before reduction was observed. A marked increase in carbon dioxide and a less increase in nitrogen occurred during this period. Exposure of milk to sunlight resulted in rapid dissipation of oxygen, and dye in milk could be reduced by sunlight without evidence of metabolic activity. An inhibitive effect of sunlight toward bacterial growth was frequently observed. Partial depletion of all gases in milk by evacuation resulted in greatly decreased reduction time, but augmentation of the oxygen content had little effect on subsequent reduction time. Data are also presented on the quantitative nature of gaseous rearrangements occurring during pasteurization, cooling, and handling of milk. It is suggested that reduction of either dye may occur in two steps, (1) oxygen exhaustion to a minimum level, and (2) mobilization and transference of hydrogen to the dye molecule.

**The relation of iodine and peroxide numbers to oxidized flavor of milk,** D. H. Nelson and C. D. Dahle. (Pa. Expt. Sta.). (*Jour. Dairy Sci., 23 (1940), No. 5, pp. 391–398*).—Samples of milk and cream obtained from cows known to produce spontaneous oxidized flavor were subdivided and subjected to (1) 80° C. for 10 min., (2) 62° for 30 min., and (3) no heat treatment. All samples were then stored in the dark at 4.5° until examined and analyzed. Samples of both milk and cream known to be resistant to spontaneous oxidized flavor were treated in a similar manner except that copper was added after pasteurization to those samples heated to 62°. Analyses made of the purified butterfat from the fresh samples and again when pronounced oxidized flavor had developed showed that no significant changes in either iodine number or peroxide number occurred even when a strong oxidized flavor had developed. Marked changes in these values did not occur until after the color of the butterfat was affected.

***Ascorbic acid and oxidized flavor in milk.*—II, The effect of various heat treatments of milk upon the stability of ascorbic acid and upon the development of the oxidized flavor,** E. C. Gjessing and G. M. Trout. (Mich. Expt. Sta.). (*Jour. Dairy Sci., 23 (1940), No. 5, pp. 373–384, figs. 5*).—Continuing these investigations (E. S. R., 81, p. 565), individual samples of milk from 20 cows were pasteurized for 30 min. at 145.4° and 167° F., with and without the addition of copper to the milk. In general, the ascorbic acid was quite unstable in the milk processed at the lower temperature with copper added after pasteurization, and such milk was prone to the development of oxidized flavor after 3 days' storage. In milk pasteurized at the higher temperature, the ascorbic acid was relatively stable, and no oxidized flavor developed after 3 days regardless of the presence or absence of copper. The milk of some cows ex-

hibited a natural stability for ascorbic acid regardless of processing methods. With flash pasteurization of individual cow and also mixed herd samples, the critical temperature for promoting ascorbic acid stability was between 167° and 185°, a temperature of about 176° generally giving the greatest stabilizing effect. The addition of copper before heat treatment had a greater destructive effect on ascorbic acid, even at the optimum protective temperature, than when copper was added after pasteurization. Conversely, the addition of copper after heating induced more intense oxidized flavor development than when added before heat treatment. Below the critical temperature "pure" oxidized flavor usually occurred, while above this temperature "pure" cooked flavor was apparent, suggesting that the formation of reducing substances at the higher temperatures may play an important role in the ascorbic acid titration values and in the development of oxidized flavor.

**Classification in dairy bacteriology,** J. G. Davis (*Dairy Indus., 5 (1940), Nos. 2, pp. 41–44; 3, pp. 72–74; 4, pp. 99–103*).—This contribution from the National Institute for Research in Dairying presents a simple scheme of identification and classification of bacteria for dairy scientists. Part 1 deals with fundamental considerations in classifying bacteria and includes a general scheme for grouping various types of organisms. Later discussion deals with methods of identification, part 2 covering characteristics of importance in determining the genus of an organism and part 3 describing the identification of types and species.

**Hemolytic streptococci in raw market milk,** J. B. Gunnison, M. P. Luxen, M. S. Marshall, and B. Q. Engle (Univ. Calif. et al.). (*Jour. Dairy Sci., 23 (1940), No. 5, pp. 447–455*).—An examination of raw market milk samples (mixed herd milk) from 444 dairy farms revealed the presence of hemolytic streptococci in 134 of the samples, of which only 4 contained streptococci which could not be assigned to a group. The distribution of the organisms among the Lancefield serologic groups was as follows: Group A, 3; group B, 125; group C of animal type, 1; group C of human type, 2; group E, 2; group G, 6; and group H, 1. Of 19 samples of cream tested 5 were found to contain group-B streptococci. Double zones of hemolysis in rabbit blood agar were produced by about one-half of the group-B organisms.

**Study of dairy cleaning problems, I, II,** J. J. Johnson and C. T. Roland (*Jour. Dairy Sci., 23 (1940), No. 5, pp. 457–469, figs. 2*).—Two reports are noted.

I. *Films and deposits on hot-milk equipment* (pp. 457–461).—A simple apparatus for studying the formation of heat-deposited milk film is described. The results of seven trials involving a series of variable conditions gave evidence that two definite types of films occur, one of cheeselike consistency resulting from superheating and partial dehydration of milk around gas bubbles at the heat-transfer surface, the other a thin metalliclike film which may occur independently or concomitantly with the former type. Accumulation of the latter type is considered the primary cause of milkstone formation on hot-milk equipment.

II. *Effectiveness of alkalies in removing heat-deposited milk solids and butterfat films* (pp. 463–469).—In experiments dealing with heat-deposited milk solids it was found that the approximate minimum concentrations of alkalies effective in their removal were trisodium phosphate 0.3 percent, sodium metasilicate 0.2, sodium carbonate 0.2, and sodium hydroxide 0.04 percent. The minimum effective pH values were sodium carbonate 11.2, trisodium phosphate 11.8, and sodium metasilicate and sodium hydroxide 12. A study of the removal of butterfat from glass indicated that sodium hydroxide was not effective at any concentration between 0.05 and 2 percent, whereas sodium carbonate, sodium metasilicate, and

trisodium phosphate were all fairly effective at concentrations above 0.1 percent. A combination of sodium hydroxide with either sodium metasilicate or trisodium phosphate was more effective in removing fat than the hydroxide and carbonate. A surface-active organic detergent used either alone or in combination with sodium hydroxide was effective in fat removal, although it did not produce emulsification when used alone.

**The butter industry,** O. F. Hunziker (*LaGrange, Ill.: Author, 1940, 3. ed., rewritten and enl., pp. [8]+821, figs. 136*).—The third edition of this well-known textbook (E. S. R., 57, p. 769) has been completely rewritten and enlarged.

***Acid values and acid ratios as related to the keeping quality of salted* butter,** H. A. Bendixen. (Wash. Expt. Sta.). (*Jour. Dairy Sci., 23 (1940), No. 4, pp. 275–284*).—Acid values were determined on both the butter and the purified butterfat from 28 samples of sweet cream butter, 51 samples of neutralized cream butter, and 8 samples of neutralized cream butter with butter culture, the samples being obtained from the fresh butter and also after 1 week's storage at 21° C. and after 1 mo. at 0°–5°. Average values for the sweet cream butter were 0.096, 0.109, and 0.103 and for the neutralized cream butter 0.122, 0.14, and 0.132 percent for the fresh, week-old, and month-old samples, respectively. Certain trends were observed which appear to have significance in predicting the keeping quality of the butter. High increases in the acid values after storage at either temperature showed a fairly high correlation with reduced keeping quality, particularly of the sweet cream butter. Also an increase in the acid ratio (fat acidity: butter acidity) during the storage periods seemed to be closely related to poor keeping quality, particularly for sweet cream butter. The average acid ratios were higher after 1 mo. at 0°–5° than after 1 week at 21°.

**The keeping quality of butter,** C. M. Sorensen (*Jour. Dairy Sci., 23 (1940), No. 5, pp. 423–436*).—This is a summary of the common defects observed in commercial butters based on the examination of over 22,000 samples. Putrid and cheesy-type flavor development was most frequently encountered, and the major cause of this difficulty was traced to contamination of creamery water supplies by spoilage types of bacteria. Rancid flavor development was also a common defect. Comparatively few cases of mold, staleness, or tallowy flavor development were encountered.

**"Just salt" is obsolete in the cheese industry,** J. C. Marquardt (*From Res. [New York State Sta.], 6 (1940), No. 3, p. 10, figs. 3*).—A brief discussion of modern methods of salt production and the relation of salt to quality and means of preventing salt and quality losses in cheese.

**Packaging sliced Cheddar and Swiss cheese in cans for sandwich dispensers,** H. L. Wilson (*U. S. Dept. Agr., Misc. Pub. 386 (1940), pp. 8, figs. 7*).—Directions are presented for preparing loaves of Cheddar cheese curd of desirable shape and size, slicing and wrapping the loaf, and packing in valve-vented cans for curing and merchandising. The same package has been successfully used for cured Swiss cheese by cutting desirably shaped loaves from large wheels of cheese, slicing, wrapping, and packaging. The chief advantage of this method of merchandising is that slices of natural cheese of uniform shape, size, and thickness and without waste are made available for the sandwich trade. Adaptation of the method to various-sized packages is described.

**Report of committee on ice cream sanitation,** F. W. Fabian et al. (*Jour. Milk Technol., 3 (1940), No. 2, pp. 72–74*).—A further report of this committee (E. S. R., 82, p. 248), covering suggested standards for ice cream ingredients and various problems confronting ice cream control agencies in the United States and Canada.

**Examination of ice cream with the Burri smear culture technic, H. F. Long and B. W. Hammer.** (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 14 (1940), No. 2, pp. 163–177, pls. 3*).—An adaptation of the Burri smear culture technic to the examination of ice cream is described, and the results of a large number of samplings of both the surface and the interior of ice creams are presented. The method proved useful in studying the distribution of bacteria in ice cream, particularly when comparing the numbers of organisms in the interior and at the surface of dipped ice creams. Difficulty was encountered in picking uniform weight samples. Counts with the Burri smear technic tended to be higher than plate counts, which is in opposition to that encountered in butter (E. S. R., 80, p. 678).

**Egg solids, M. A. Widland and M. J. Mack.** (Mass. State Col.). (*Ice Cream Trade Jour., 35 (1939), No. 10, pp. 21, 48, 56, fig. 1*).—Data are presented on the composition, including the percentage of yolk solids, of seven samples of powdered egg yolk and egg powder blends, also on the effect of adding 0.3 percent of these egg products to ice cream mixes on the quality of the resulting ice cream. Whipping ability, melting properties, and texture of ice cream were generally improved by the addition of egg yolk solids. The value of the various products was therefore in proportion to the yolk solid content. Old or stale egg products detracted from the flavor of ice cream even when added at 0.3 percent levels.

## VETERINARY MEDICINE

**[Contributions on animal pathology and parasitology]** (*3. Internatl. Cong. Microbiol., New York, 1939, Rpt. Proc., pp. 283, 284, 287–292, 293, 300–309, 310, 311, 318, 323–326, 334–345, 346, 347, 360–365, 388, 389, 390–394, 413–416, 418, 419, 421, 422, 428, 429–438, 443–445, 454–471, 472–482, 523, 524, 525, 526, 527, 528, 581, 582–589, 594–596, 596, 597, 598–611, 612, 613, 614, 620, 621, 622, 623, 625, 628–631, 632–634, 634–643, 647, 664–668, 669–678, 832–840*).—Contributions presented at the Third International Congress for Microbiology held at New York City in September 1939, and here reported, include: The Nature of Viruses, by J. McIntosh (p. 283); The Essence of the Ultravirus Based on Recent Researches, by J. v. Darányi (pp. 283, 284); Use of the Ultracentrifuge in the Study of Yellow Fever Virus, by J. H. Bauer and E. G. Pickels (pp. 287, 288); Comparative Studies on Ultracentrifugation and Serological Reactions of Bacteriophages, Plant Viruses, and Insect Viruses, by A. Gratia (pp. 288, 289); Experiments on Immunity to Fowl-Pox, Especially by Means of Skin Grafts on the Chorio-Allantois of Chick Embryos, by E. W. Goodpasture and K. Anderson (pp. 289, 290); Passive Immunity to Newcastle Disease Virus in the Chick Embryo, by E. V. Keogh (p. 290); Susceptibility of Mammalian Fetuses to Viruses, by N. P. Hudson and O. C. Woolpert (pp. 291, 292); Comparative Investigations on the Cultivability of Viruses by Different Methods of Tissue Culture [trans. title], by E. Haagen (pp. 292, 293); Mosquito Transmission of Equine Encephalomyelitis, by R. A. Kelser (p. 300); Transmission of Equine Encephalomyelitis, by C. TenBroeck (pp. 300, 301); Human Encephalitis Caused by the Virus of Equine Encephalomyelitis, by L. D. Fothergill (pp. 301, 302); Equine Encephalomyelitis—Its Relationship to Man and Animals in California, by B. F. Howitt (pp. 302, 303); Neutralization Tests With the Sera of Pheasants Surviving an Outbreak of Equine Encephalomyelitis, by F. R. Beaudette (pp. 303, 304); Immunological Studies on the Virus of Equine Encephalomyelitis, by P. K. Olitsky and I. M. Morgan (pp. 304, 305); Changes of the Central Nervous System in Equine Infectious Anemia and Their Differentiation From Those of Other Virus Diseases of the Horse [trans. title], by O. Seifried (p. 307); The Comparison of Concentrations of the Virus

of Japanese Encephalitis in Blood, Cerebro-Spinal Fluid, and Brain Tissue From Encephalitis Patients, Monkeys, and Mice, by R. Kobayashi (p. 308); The Immunity of the Mouse to Lymphocytic Choriomeningitis [trans. title], by E. Traub (pp. 308, 309); A Soluble Antigen of Lymphocytic Choriomeningitis, by J. E. Smadel and T. M. Rivers (pp. 310, 311); The Forms and Types of X-Bodies Formed by Different Viruses Within the Same Host, by F. P. McWhorter (p. 318); In Vitro Culture of Rabies Virus, by K. Kanazawa (p. 323); The Cultivation of Fixed Rabies Virus and the Immunizing Properties of Culture Virus, by I. J. Kligler and H. Bernkopf (pp. 323, 324); Immunizing Potency of Antirabic Vaccines, by L. T. Webster (pp. 324, 325); Human Rabies With Special Reference to Virus Distribution and Pathology, by C. N. Leach and H. N. Johnson (pp. 325, 326); Viruses and Carcinogenic Chemicals, by C. H. Andrewes (pp. 334, 335); The Nature of Chicken Tumors, by J. B. Murphy and A. Claude (p. 335); The Filterable Agents of Avian Sarcomata and Serological Experiments in Connection Therewith, by C. R. Amies, J. G. Carr, and J. C. G. Ledingham (pp. 335, 336); Characteristics of Viruses and Related Substances Producing Leukosis and Sarcoma, by J. Furth and E. A. Kabat (pp. 336, 337); The Leukemias and the Leukemic Conditions of Fowls Resulting From the Application of Tars or Cancerigenic Carbons [trans. title], by C. Oberling and M. Guérin (pp. 337, 338); Some Chemical Aspects of the Agents of Chicken Sarcoma and Fowl Leukemia, by F. Pentimalli (p. 338); An Attempt to Differentiate Between Infective and Non-Infective Tumours and Their Response to Radium Treatment, by P. R. Peacock (pp. 338, 339); The Effect of Neoplastic Viruses as Conditioned by the Age of the Host—Studies on Chicken Sarcomas and Rabbit Fibroma Viruses, by F. Duran-Reynals (pp. 339, 340); The Relation of a Rabbit Virus (the Shope Papilloma Virus) to Cancer Causation, by J. G. Kidd and P. Rous (pp. 340, 341); The Papilloma-Carcinoma Sequence in the Cottontail (*Sylvilagus*) Rabbit, by J. T. Syverton (pp. 341, 342); Chemical Studies on the Active Agent of the Cottontail Rabbit Papilloma (Shope), by S. Oberndorfer, P. Ladewig, and B. Ottenstein (p. 342); Infectious Rabbit Myxomatosis—A Review of Recent Observations, by A. Moses (pp. 342, 343); The Fibroma-Myxoma "Spectrum" of Viruses, by G. P. Berry (pp. 343, 344); The Viral Origin of Mammalian Tumors, by Newiadomsky (pp. 344, 345); Problem of Virus Etiology of Benign Intestinal Tumours, by J. Baló (pp. 346, 347); The Active Immunization Against Foot-and-Mouth Disease [trans. title], by O. Waldmann and K. Köbe (pp. 360, 361); The Cultivation of the Virus of Foot-and-Mouth Disease, by H. S. Frenkel (p. 361); Vesicular Exanthema of Swine, by A. B. Crawford (pp. 361, 362); Studies in Louping-Ill, Tick-Borne Fever, and Scrapie, by W. S. Gordon, A. Brownlee, and D. R. Wilson (pp. 362, 363); Malignant Panleucopenia of Cats—A Virus Disease, by J. F. Enders (pp. 363, 364); Climatic Influence on Rickettsial Infection in Rodents, by R. E. Dyer (p. 388); Pathology of Rickettsial Diseases in Rodents, by R. D. Lillie (pp. 388, 389); A Pathogenic Rickettsia From the Gulf Coast Tick (*Amblyomma maculatum*), by R. R. Parker (pp. 390, 391); Studies of a Filter-Passing Infectious Agent Isolated From Ticks, by H. R. Cox (pp. 391, 392); Colorado Tick Fever, by G. E. Davis (p. 393); Relation of Boutenneuse Fever to the Other Rickettsial Diseases, by D. and J. Olmer (pp. 393, 394); Observations on the Pathology of Trichomonas Vaginitis and on Vaginal Implants With *Trichomonas vaginalis* and *Trichomonas intestinalis*, by J. F. Kessel and J. A. Gafford, Jr. (pp. 413, 414); The Biology and Pathogenicity of the Trichomonads in Domestic Animals [trans. title], by K. Beller (pp. 415, 416); The Nature of the Blepharoplasts of Trypanosomes [trans. title], by E. Reichenow (pp. 418, 419); Chagas' Disease—A Comparative Study of the Susceptibility of Four Natural Vectors to the Experimental Development of *Schizotrypanum cruzi*,

by E. Dias (pp. 421, 422); Observations on Development of *Plasmodium praecox*, by A. Missiroli (p. 428); Recent Work on the Chemotherapy of Protozoal Infections, by W. Yorke (p. 429); Relationships of the Acanthocephala, by H. J. Van Cleave (pp. 431, 432); The Culture of Parasitic Nematodes, by R. W. Glaser (pp. 432, 433); *Anabiosis* in Nematodes, Its Distribution, Mechanism, and Significance, by G. Steiner (p. 434); Experimental Studies on the Validity of Species in the Genus *Strongyloides*, by D. L. Augustine (pp. 435, 436); *Metorchis conjunctus* (Cobbold 1859) Looss 1899, by T. W. M. Cameron (pp. 437, 438); Occurrence of Trichinae (*Trichinella spiralis*) in Swine in the United States, by B. Schwartz (pp. 443–445); The Indirect Mode of Larval Reproduction in the Nematode *Strongyloides ratti*, by G. L. Graham (pp. 454, 455); The Bionomics of Strongyloid Larvae and the Epizootology of the Helminthiases of Grazing Animals, by E. L. Taylor (pp. 456, 457); Factors Influencing the Numbers and Pathological Effects of Nematodes Parasitic in the Alimentary Tract of Sheep in Canada, by W. E. Swales (pp. 457, 458); Life Cycle Studies on *Contracaecum spiculigerum*, a Nematode From the Cormorant (*Phalacrocorax auritus*) and Other Fish-Eating Birds, by L. J. Thomas (pp. 458–460); Observations on the Development of the Cestode *Bertiella studeri*, by H. W. Stunkard (pp. 460, 461); Proof of Hyperinfection (Internal Autoinfection) in Strongyloidiasis, by E. C. Faust and A. DeGroat (p. 462); An Intermediate Host [Lungworm] in Which Swine Influenza Virus Can Persist Between Epizootics, by R. E. Shope (pp. 462, 463); A Study of the Antigenic Properties of Certain Ciliates Belonging to the Glaucoma-Colpidium Group as Shown in Their Response to Immune Sera, by M. Robertson (pp. 464, 465); The Antigenic Composition and Immunizing Properties of Trypanosomes, by I. J. Kligler, L. Olitzki, and H. Kligler (pp. 465, 466); Protracted Immunity in Rabbits Cured of *Trypanosoma rhodesiense* Infection With Aromatic Arsenical Compounds, by W. I. Strangeways (pp. 466, 467); The Natural Resistance Against Animal Parasites Acquired as Hosts Mature, With Special Reference to the Mechanisms of This Resistance in the Experimental Trypanosomiases, by J. T. Culbertson (pp. 467, 468); The Action of Immune Serum on *Plasmodium knowlesi* Malaria Parasites in Vitro, by L. T. Coggeshall (pp. 469, 470); Immunity in Avian Malaria, by R. D. Manwell (p. 470); On Strains or Races of the Malaria Parasites, by M. F. Boyd (p. 471); Reinfection of Grazing Sheep With Gastro-Intestinal Nematodes, A Synoptic Experiment, With Follow-Up, by N. R. Stoll (pp. 472, 473); Immunity to Trichiniasis in Rats, by O. R. McCoy (pp. 474, 475); The Immunological Reaction of the Canine Host to Experimental Hookworm Infection, by G. F. Otto (pp. 476, 477); Premunition and Immunity in *Hymenolepis diminuta* Infections in Rats, by A. C. Chandler (pp. 477, 478); Tissue Reactions in Normal Rats and Rats Infested with *Cysticercus fasciolaris* Against Injected *Cysticercus* Material, by R. Hoeppli (pp. 478, 479); The Cellular Reactions During Immunity to *Nippostrongylus muris*, by W. H. Taliaferro and M. P. Sarles (pp. 479, 480); Duodenal Goblet Cells and Age Resistance to Intestinal Parasitism, by J. E. Ackert, S. A. Edgar, and L. P. Frick (pp. 481, 482); Etiology and Pathogenesis—Animal Kingdom, by F. D. Weidman (p. 523); Tissue Reactions—Animal Kingdom, by D. J. Davis (pp. 524, 525); Natural Resistance, Including Immunity—Animal Kingdom, by J. G. Hopkins (pp. 526, 527); Further Studies on Infection of Scale Insects by *Septobasidium*, by J. N. Couch (pp. 527, 528); The Dog as a Natural Host for *Histoplasma capsulatum*—Report of a Case of Histoplasmosis in This Animal, by W. A. DeMonbreun (p. 528); The Present Status of Chemotherapy of Bacterial Infections [trans. title], by G. Domagk (pp. 581, 582); The Mode of Action of Sulphanilamide, by A. T. Fuller and L. Colebrook (pp. 582, 583); The Activity of Sulphanilamide and Its Azo Dye Derivatives in Vivo and in Vitro, by G. A. H.

*Buttle and D. Stephenson* (pp. 583–585); *Observations Upon the Mode of Action* of Sulfanilamide and Sulfapyridine, by E. A. Bliss and P. H. Long (pp. 585, 586); On the Testing of Chemotherapeutic Drugs, and Their Synergistic Action With Anti-Sera, by A. Fleming (pp. 586, 587); Therapeutic Effectiveness in Relation to Blood Concentration of Sulfanilamide and Related Drugs in Streptococcus Infections in Mice, by E. K. Marshall, Jr., J. T. Litchfield, Jr., and H. J. White (pp. 587, 588); The Relationship of Sulphanilamide's Anti-Catalase Property to the Mechanism of Its Bacteriostatic Effect, by R. R. Mellon, A. P. Locke, and L. E. Shinn (pp. 588, 589); Sulfonamide Treatment of Experimental Tuberculosis in the Guinea Pig, by K. Birkhaug (pp. 594, 595); The Effect of Sulfanilamide and Related Compounds on Bacterial Toxins, by C. M. Carpenter (pp. 595, 596); Disturbances in Pigment Metabolism Following Administration of Drugs of the Sulphonamide Series and Simpler Related Substances, by C. Rimington (pp. 596, 597); Mode of Action of Acridine Derivatives, by W. Steck (p. 598); Some Nonsulfur Compounds of Interest in Bacterial Chemotherapy, by S. M. Rosenthal (pp. 598, 599); The Localization and Manifestation of *Brucella* Infections in Animals, by W. A. Hagan (p. 605); Brucellosis in the Midlands of England, by J. Menton (pp. 605, 606); Vaccination of the Guinea Pig and Sheep Against Brucellosis (*Brucella melitensis*) [trans. title], by M. Lisbonne, G. Roman, and G. Renoux (pp. 606, 607); The Immunizing Value of Chemical Fractions of *Brucella* Cells Against Brucellosis and Against the Toxic Effects of Endoantigen, by I. F. Huddleson (pp. 607, 608); Studies on a Purified Antigen From *Brucella*, by P. Morales-Otero and L. M. González (pp. 608–610); The Behavior "In Vivo" of the Spontaneous Dissociated Variants of *Mycobacterium tuberculosis avium*, by A. J. Ferreira (p. 611); Nature of the Dissociation of the Avian Bovine Type of the Tubercle Bacillus [trans. title], by A. Saenz (pp. 612, 613); The Location and Type of Pulmonary Lesions in Cattle With Naturally Acquired Tuberculosis, by E. M. Medlar (pp. 613, 614); The Bactericidal Effect of Serum From the Tuberculous on Tubercle Bacilli [trans. title], by T. V. Simitch (pp. 620, 621); The Value of the Immuno-Serological Test for Tuberculosis, by C. Verdina (p. 622); Anacoresis in Tubercular Infection, by A. Ascoli (pp. 622, 623); Effects of Vitamin C on Experimental Tuberculosis and Tuberculin Intoxication, by M. M. Steinbach (p. 625); The Serological *Salmonella*-Diagnosis, by F. Kauffmann (pp. 628, 629); The Antigenic Analysis of *Salmonella* species Derived From Domestic Animals, by P. R. Edwards and D. W. Bruner (pp. 629, 630); The Swarming Phenomenon in the *Salmonella* Group, by S. Gard (p. 630); Virulence and Immunizing Properties of Rough and Smooth Strains of *Salmonella aertrycke*, by G. M. Mackenzie and R. M. Pike (pp. 630, 631); A Method Based Upon Bacterial Motility for the Rapid Isolation and Identification of Para-Typhoid Bacilli, by A. Wassén (pp. 632–634); Variations of *B[acillus] coli* in Relation With Bacterial Inhibitory Agents, by A. Gratia (pp. 634, 635); Protective Antibodies in Syphilis, by T. B. Turner (pp. 636, 637); Some Observations on the Antispirochetal Action in Vitro of Arsphenamines, Phenylarsenoxides, Bismuth, and Mercury Compounds, by H. Eagle and G. O. Doak (pp. 637, 638); Leptospirosis in the British Isles, by J. M. Alston (pp. 638, 639); Leptospira Infection (Weil's Disease) in Norway, by T. Thjötta and L. Borgen (pp. 639, 640); A Comparative Study of the Antipneumococcal Activities of Macrophages and Polymorphonuclear Leucocytes in Normal and Immune Dogs, by O. H. Robertson and H. Van Sant (p. 647); *Streptococcus agalactiae* as an Entity and Definite Etiological Agent in Bovine Mastitis, by W. N. Plastridge (pp. 664, 665); The Localization of Streptococci in Experimentally Infected Animals, by B. Mela (pp. 665, 666); Toxin Production by Gas Gangrene Anaerobes, by G. B. Reed, J. H. Orr, and M. C. Baker (pp. 669, 670); Anaerobic Bacteria Associated in the

Etiology of Foot-Rot in Sheep, by W. I. B. Beveridge (pp. 670, 671); Blackleg and Associated Conditions of Cattle, by J. P. Scott and I. Live (pp. 671, 672); *Bacterium necrophorum* in Chronic Ulcerative Colitis, by G. M. Dack, L. R. Dragstedt, and J. B. Kirsner (pp. 672, 673); Pseudo-Gangrene Complications in the Course of Foot-and-Mouth Disease of Bovines [trans. title], by M. Weinberg and P. Forgeot (p. 673); Latent Sylvatic Plague, by K. F. Meyer (pp. 675, 676); Active Immunization Against Plague, by H. L. Schutze (pp. 676, 677); *Bacterium tularense*, by E. Francis (pp. 677, 678); and Report of the Subcommittee of the Nomenclature Committee of the International Association of Microbiologists on the Genus *Salmonella* (pp. 832–840).

**[Work in animal pathology by the Massachusetts Station]** (*Massachusetts Sta. Bul. 369 (1940), pp. 92–96*).—The work of the year briefly reported upon (E. S. R., 81, p. 569) relates to pullorum disease eradication, diagnosis, *Pasteurella* and *Pasteurella*-like cultures (avian origin), avian encephalomyelitis, equine encephalomyelitis virus (eastern type), viability of *Salmonella pullorum*, and pullorum disease in turkeys, all by H. Van Roekel, K. L. Bullis, O. S. Flint, and M. K. Clarke; and studies of neoplastic and neoplasticlike diseases of poultry, by C. Olson, Jr.

**[Work in animal pathology by the New Hampshire Station]** (*New Hampshire Sta. Bul. 319 (1940), pp. 30, 31, 43, 44, 45*).—The work of the year briefly reported upon (E. S. R., 82, p. 249) includes studies of bovine mastitis, by L. W. Slanetz; paralysis in chickens, by C. L. Martin and M. S. Cover; control of coccidiosis in poultry, by Martin, Cover, T. B. Charles, and R. C. Durgin; methods of administering medicine to sheep, by Martin; pullorum eradication; and poultry autopsies, by C. A. Bottorff, Martin, and Cover.

**Myocardial lesions resulting from dietary deficiency, R. M. Thomas, E. Mylon, and M. C. Winternitz** (*Yale Jour. Biol. and Med., 12 (1940), No. 4, pp. 345–360, pls. 4, figs. 2*).—Investigations have shown that rats and hogs develop severe myocardial lesions, characterized by necrosis of muscle fibers and marked cellular infiltration, when they are fed a diet deficient in potassium and in vitamin B.

**Brucellosis or Bang's disease of farm animals, C. P. Fitch and W. L. Boyd** (*Minnesota Sta. Bul. 348 (1940), pp. 32, figs. 12*).—A practical summary of the present status of Bang's disease of farm animals is presented. It is pointed out that the agglutination test of the blood is an invaluable aid in the diagnosis of the disease and at the present time is the best method for its control. The present Federal-State Bang's disease program is considered to be an economical method for ridding a herd of this infection.

**Ineffectiveness of proprietary remedies and other drugs in the control of Bang's disease, with special reference to "3–V Tonic" and "Bowman's," A. B. Crawford and B. A. Beach.** (U. S. D. A. and Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 8, pp. 565–574*).—Report is made of a study, conducted under special Congressional authority, which consisted of carefully controlled tests of two widely used, alleged remedies for Bang's disease, namely, 3-V Tonic and Bowman's. The details of the work are given in tables. Thus far no drug or therapeutic chemical of a large number tested by qualified investigators under controlled conditions has proved to be effective in the prevention or cure of Bang's disease. The animals treated with these two products, 60 and 40 head, respectively, both before and after exposure to virulent *Brucella* organisms, became chronically affected with Bang's disease in the same manner and to about the same degree as the untreated control animals in the experiments.

**A survey of the types of Cl. welchii present in soil and in the intestinal contents of animals and man, A. W. Taylor and W. S. Gordon** (*Jour. Pathol.

*and Bact., 50 (1940), No. 2, pp. 271–277*).—In an attempt to determine the significance of the toxin of *Clostridium welchii* type D in, and the isolation of the associated organism from, the intestinal contents of a few acute cases of grass sickness in horses, a survey was made of the types of *C. welchii* normally present in farm soil and in the intestinal contents of man and several animal species. "Of 196 strains of *C. welchii* isolated from 43 samples of farm soil, 7 were of type D and the remainder of type A. Of 1,147 strains isolated from the intestinal contents of man and of several species of animals, 1,134 were of type A, 3 of type B, and 10 of type D. The type B strains were isolated from a wild rabbit. Of the D strains, 1 was isolated from a sheep, 2 from a bovine, and 7 from a domesticated rabbit. Of 174 filtrates prepared from intestinal contents, the toxin of *C. welchii* was detected in only 1, a sample from a rabbit which died after an acute illness. This was of type D, and the animal probably died of enterotoxemia."

**Antigenic variation in a strain of Cl. welchii type C (B[acillus] paludis),** A. W. TAYLOR (*Jour. Compar. Pathol. and Ther., 53 (1940), No. 1, pp. 50–54*).—In the studies reported the gradual loss of ability over a period of years by cultures of *Clostridium welchii* type C, and by cultures of the same strain obtained from different sources, to produce C toxin (Z factor of Wilsdon, beta toxin of Glenny) were demonstrated. This is said to confirm the findings of Dalling and Ross (E. S. R., 80, p. 826) that a culture of *C. welchii* type C on occasion fails to produce C toxin.

**Cyanosis in chickens and mice induced by sulfanilamide,** A. P. RICHARDSON (*Bul. Johns Hopkins Hosp., 65 (1939), No. 6, pp. 445–455*).—A description is given of methods of inducing sulfanilamide cyanosis in chickens and mice. In chickens the cyanosis is explained by the formation of methemoglobin, while in mice the presence of cyanosis is accounted for by the presence of sulfhemoglobin. Under the conditions described, sulfanilamide will convert hemoglobin into methemoglobin in vitro. Methylene blue exerts a beneficial effect on the sulfanilamide cyanosis in chickens but not on the mouse cyanosis.

**Further studies on the effect of sulfanilamide on experimental tuberculosis,** R. H. FOLLIS, JR., and A. R. RICH (*Bul. Johns Hopkins Hosp., 65 (1939), No. 6, pp. 466–488, pls. 3*).—The study of the effect of sulfanilamide on experimental tuberculosis in the rabbit here reported is said to confirm the results of the authors' earlier study on the guinea pig,[8] demonstrating that adequate dosage of the drug, properly administered, has a definite inhibitory effect upon the development of tuberculosis. Individual rabbits exhibit marked differences in the degree to which they acetylate the drug and in their ability to attain and maintain a high concentration in the blood following the administration of a given dosage. These differences undoubtedly play a role in determining the degree to which a given dosage will exert a beneficial effect upon the progress of the infection in different animals.

**The relation between skin measurements and the character of the swelling in eleven hundred double intradermal tuberculin tests,** J. R. RIDER (*Vet. Jour., 96 (1940), No. 4, pp. 154–159*).—A study made of 1,100 tuberculin tests has shown that the increase in the thickness of the skin can be correlated with the character of the swelling. "The increase in skin thickness bears no relation to the age or the sex of the animal. In over 90 percent of the cattle exhibiting swellings of the accepted negative character the increase in skin thickness does not exceed 2 mm. at the forty-eighth hour, and the total increase does not exceed 3 mm. In 90 percent of the cattle exhibiting swellings of the accepted positive character the increase exceeds 3 mm. at the forty-eighth hour,

[8] Bul. Johns Hopkins Hosp., 62 (1938), No. 1, pp. 77–84.

and the total increase exceeds 5 mm. An atypical group exists showing total increases between 3 mm. and 5 mm. This group contains animals which may react after an interval of 2 to 3 mo."

**Pulmonary tuberculosis in cattle: The location and type of lesions in naturally acquired tuberculosis,** E. M. Medlar (*Amer. Rev. Tuberc.*, *41* (*1940*), *No. 3*, *pp. 283–306*, *figs. 4*).—Report is made of the results of a statistical analysis as to type and location of 2,005 lesions from 520 pairs of tuberculous bovine lungs. The findings indicate that the infection is air-borne. The greater frequency, per unit volume, of tuberculous foci in certain specified areas of the lung parenchyma in comparison with other areas cannot be satisfactorily explained on a basis of the mechanics of respiration. A comparison of the predominant location of cavitating lesions in cattle and in man suggests that the difference between the two species cannot be explained on a basis of air-borne distribution or on a basis of the mechanics of respiration. The dominance of progressive tuberculosis in the more elevated portions of the parenchyma of lobes of lung tissue in both species can best be explained on the hypothesis that posture influences the condition within the lung parenchyma. What alterations may be induced by posture remain to be determined. From this study it is also evident that calcification is not a common occurrence in bovine pulmonary tuberculosis in the less advanced stages of the disease. Endobronchial tuberculosis in cattle is a corollary to cavitation of a parenchymatous focus. This should be borne in mind when endobronchial tuberculosis in man is observed.

**Factors affecting reproduction in the dairy herd** (*Nebraska Sta. Rpt.* [*1939*], *p. 40*).—Brief report is made of studies of methods and practices for the elimination of trichomoniasis.

**The experience of nearly six years with calfhood vaccination,** L. J. Tompkins (*Cornell Vet.*, *30* (*1940*), *No. 2*, *pp. 178–192*, *figs. 3*).—Work carried on in New Jersey, and extending over a period of 6 yr., has shown that all individuals after vaccination give a pronounced agglutination response. "The time required to return to a negative blood status varies widely with individuals. A few individuals carry a high titer, without any recession, at least through their first lactation period. Some individuals carry a low titer for months, with a strong tendency to become negative in time. Calfhood vaccination eliminates the danger of vaccinating adult or pregnant animals. The general behavior of the reactions following calfhood vaccination is such that they are not too confusing when interpreting the subsequent herd tests. The administration of a vaccine, prepared from *Br*[*ucella*] *abortus* strains with the low virulence of strain 19, seems to be practically free of danger when used on from 5- to 7-month-old calves. Clinical abortions and retained placentae do occur in animals vaccinated at calfhood, but apparently from other causes than *B. abortus*, when we accept the agglutination blood test as an indicator of *B. abortus* infection. Vaccination with strain 19 at the proper age seems to take off the 'edge in susceptibility' and act as good insurance against Bang's infection. With cleaner herds each year, natural exposure to calves will be gradually eliminated even though of questionable value, so artificial vaccination may produce this protection."

**Methods of controlling the liver fluke of cattle in Hawaii,** J. E. Alicata, L. E. Swanson, and G. W. H. Goo (*Hawaii Sta. Circ. 15* (*1940*), *pp. 23*, *figs. 5*).—It is concluded that the liver fluke of cattle (*Fasciola gigantica*) in Hawaii may be best combated through control of the snail carrier *Fossaria ollula*, a common inhabitant of fresh-water streams and swamps. This includes the prevention of grazing in swamps or the feeding on grass cut from these areas and treatment of infected animals. "The snail may be controlled (1) by broadcasting copper sulfate at the rate of 20 lb. per acre, using 1 part of the chemical to 4 parts of a carrier such

as sand; (2) by application of copper sulfate in streams at the rate of 1 to 200,000 or 1 to 300,000 parts of water; or (3) by drainage of swampy areas. Cattle may be protected from infection by fencing off areas where drainage is not practical and allowing the cattle to feed only on vegetation from dry areas. Distol and kamala have been found effective in most instances in the removal of flukes in cattle. Experimental treatment was chiefly with steers and dairy cows which were nonlactating or near the end of their lactation period. Distol was found effective in most cases when given at the rate of 1 capsule to 70 lb. of body weight over a period of 2 or 3 successive days. Kamala was effective at the rate of 10 gm. of drug to 60 lb. of body weight, administered over a period of 4 days, but produced considerable diarrhea and loss of appetite lasting from a few days to about 2 weeks, and resulted in death in two instances. Additional studies are being conducted to determine the efficacy and safety of other drugs available in the United States. For the present . . . Distol is considered superior to kamala because it is safer and requires less time to administer. Kamala has the advantage of costing about one-third as much as Distol, and it may be obtained in local markets. It is suggested that Distol be used for dairy cows and kamala for beef cattle and possibly for less productive dairy cows."

**An analysis of environmental and genetic factors influencing stomach-worm infestation in sheep,** P. W. Gregory, R. F. Miller, and M. A. Stewart. (Univ. Calif.). (*Jour. Genet., 39 (1940), No. 3, pp. 391–400, figs. 3*).—In the work reported, fecal examination for trichostrongyle eggs of ewes of known ages sired by two different rams were made weekly over a period of 2 mo. from September to November 1937. "All data on the egg counts were quantitative. Though the numbers of ewes studied were somewhat limited, the results were consistent and indicate that at least three different factors influence the degree of stomach-worm infestation. The season of the year is the first variable. Age of the ewe is the second, although, in these data, age beyond 2 yr. 8 mo. ceased to be important. The third and most important variable influencing stomach-worm infestation is genetic constitution for resistance and susceptibility. Judging from these results, genetic selection should effectively change the degree of resistance or susceptibility in populations of sheep."

**Chronic copper poisoning in sheep,** I. B. Boughton. (Tex. Expt. Sta.). (*Southwest. Sheep and Goat Raiser, 10 (1940), No. 8, p. 19*).—A brief report is made of investigations which have led to the finding that the large losses of range sheep that had been licking so-called medicated salt mixtures were due to chronic copper poisoning. The percentage of copper sulfate in the medicated mixtures varied from approximately 2 to 6, and the symptoms of the disease appeared within from 5 mo. to 2 yr. after the mixtures were placed before the sheep. Stomach worms, which the mixtures were supposed to control, were found alive and unaffected in many animals.

**Botulism in equines due to contaminated drinking water and hay,** J. M. Fourie and P. S. Snyman (*Jour. So. African Vet. Med. Assoc., 10 (1939), No. 3, pp. 132–135, figs. 4*).—Observations made in the course of outbreaks of botulism in horses, mules, and donkeys have led to the diagnosis of botulism due to contamination of the hay with carcass material.

**The isolation and typing of equine encephalomyelitis virus,** M. S. Shahan, L. T. Giltner, and O. L. Osteen. (U. S. D. A.). (*Cornell Vet., 30 (1940), No. 2, pp. 151–160*).—This is a report of work conducted since 1932, during which time 65 strains from various parts of the United States have been recovered from field specimens and typed by the authors and their associates in the U. S. D. A. Bureau of Animal Industry. Case selection, technic of procuring specimens, methods of handling specimens in the field and in transit to the laboratory, and technic in the laboratory are considered in connection with the recovery of

viruses from field cases. The differential diagnosis on a pathological basis is considered, and the failure to demonstrate virus in field material is discussed. Of 267 specimens listed during the 7-yr. period, 66 yielded virus, which, with 68 others, displayed typical pathology. A discussion of the technic employed by the authors for classification of viruses as eastern or western type is included, as is a list of 16 references.

**Equine encephalomyelitis,** R. GRAHAM and H. R. HESTER. (Univ. Ill.). (*Ill. State Acad. Sci. Trans., 32 (1939), No. 2, pp. 205–207*).

**Natural infection of fleas with the dog heartworm Dirofilaria immitis,** H. W. BROWN and A. J. SHELDON. (Univ. N. C.). (*North Amer. Vet., 21 (1940), No. 4, pp. 230, 231*).—The findings reported indicate that the dog flea is a potential vector of *D. immitis*, which suggests that it may play a role in the transmission of this parasite, especially throughout portions of the South.

**Can hares and rabbits act as hosts of sheep and goat bankrupt (Trichostrongylus spp.) worms in South Africa?** R. J. ORTLEPP (*Jour. So. African Vet. Med. Assoc., 10 (1939), No. 4, pp. 166–169, figs. 2*).—The author found that *T. colubriformis* larvae recovered from sheep readily set up an infection in rabbits, and that they easily grow to maturity in this host and are able to produce eggs whose larvae are capable of setting up an infection in sheep.

**Sub-clinical coccidial infection in chickens,** P. P. LEVINE (*Cornell Vet., 30 (1940), No. 2, pp. 127–132*).—In studies reported, 39 examinations of intestinal tracts of White Leghorn pullets largely received alive from 33 premises in New York State were made for the presence of coccidia. "Ninety-two percent of the birds had no gross lesions of coccidiosis. The coccidial species were identified by observing the time of first appearance and size of oocysts discharged by test birds fed suspected material. *E[imeria] tenella* and *E. necatrix* were identified by the gross lesions these species produce in the ceca and intestine, respectively. The incidence of the various species found were as follows: *E. praecox* 13 times (33 percent), *E. acervulina and E. mitis (considered as a single category)* 21 times (53 percent), *E. maxima* 11 times (28 percent); *E. necatrix* 15 times (38 percent), [and] *E. tenella* 9 times (23 percent). The finding of such a high percentage of subclinical infections with *E. necatrix* and *E. tenella* was especially surprising."

**Phenothiazine for the removal of Heterakis gallinae from chickens,** E. C. MCCULLOCH and L. G. NICHOLSON. (Wash. Expt. Sta.). (*Vet. Med., 35 (1940), No. 7, pp. 398–400, fig. 1*).—The authors report tests in which phenothiazine was administered to Single-Comb White Leghorn chickens suffering from a natural heavy infestation of cecal worms. *H. gallinae*, a common parasite of chickens, served as a vector for *Histomonas meleagridis*, the cause of enterohepatitis. The drug was given either in the feed or in hard gelatine capsules, both single and repeated doses being tested. "Between 0.05 and 0.5 gm. was found to be a satisfactory individual dose. Repeated doses and administration of the drug in individual capsules were found to be slightly more satisfactory, although flock medication appears to be practical. The average effectiveness was between 95 to 100 percent, both from the standpoint of cecal worms expelled and killed. Enormous doses, up to 500 times the smallest amount therapeutically effective, had no apparent harmful effect on the birds; such massive doses also had no antiheterakid effect. Individual capsule medication of 0.5 gm. had no appreciable effect on a flock in egg production. Neither massive nor therapeutic doses had any effect upon the flavor of the meat. The administration of phenothiazine was not followed by enteritis or other digestive disturbances, except for a slight softening of the feces 24 hr. following treatment. The use of phenothiazine as an anthelmintic for the removal of heterakids is recommended, even though the most desirable dosage has not been definitely determined."

## AGRICULTURAL ENGINEERING

**[Agricultural engineering investigations by the Massachusetts Station]** (*Massachusetts Sta. Bul. 369 (1940), p. 45*).—These have included cranberry storage investigations, by C. I. Gunness, H. J. Franklin, and C. R. Fellers; work on frost protection on cranberry bogs (use of a wind machine), by Gunness; and poultry-house investigations (electric brooders in insulated and noninsulated colony houses), by Gunness and W. C. Sanctuary.

**[Agricultural engineering investigations by the Nebraska Station]** (*Nebraska Sta. Rpt. [1939], pp. 46–49*).—These have included work on performance characteristics of rubber tires on tractors, adaptation of small electric motors to farm use (coop. U. S. D. A.), automatic electrical water systems, electrical water heating for livestock, methods of cooling milk on the farm and their effect on quality, the adaptability of electric hotbeds to farm use, adaptation of insulated electric brooders in uninsulated poultry houses, and mechanical equipment for the eradication of bindweed.

**Surface water supply of the United States, 1938, parts 5, 8** (*U. S. Geol. Survey, Water-Supply Papers 855 (1940), pp. IX+350, pl. 1; 858, pp. VII+355, pl. 1*).—These papers record measurements of stream flow for the year ended September 30, 1938, No. 855 covering the Hudson Bay and upper Mississippi River basins, and No. 858 the western Gulf of Mexico basins.

**The effect of several chemicals on the swelling and the crushing strength of wood,** H. D. Erickson and L. W. Rees. (Minn. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 60 (1940), No. 9, pp. 593–603, figs. 2*).—The degree of swelling of test blocks of *Pinus resinosa* (red pine) produced by concentrated solutions of certain inorganic salts, and of chloral hydrate, tannic acid, urea, pyrogallol, and resorcinol, as well as by certain of the lower aliphatic alcohols, ethylene glycol, and acetone, were determined, together with the effect of these reagents upon the maximum crushing strength of the wood. In the test with each liquid, 10 blocks, approximately 1 by 1 by 2 in. when green, were used. The blocks were dried slowly to a uniform 2 percent moisture content before treatment. Adequate penetration was obtained by forced submergence and intermittent application of a high vacuum, except that high vapor pressure of the liquid prevented attaining a high vacuum over some of the organic liquids. In the strength test a uniform rate of compression strain, approximately 0.035 in. per minute, was used.

An inverse relationship between maximum crushing strength and swelling caused by the organic liquids was indicated. At the same degree of swelling, the organic liquids swelled and weakened the wood less than water did. Swelling and loss of strength decreased with increasing carbon number of the alcohols. Benzene had no appreciable effect on wood. Nearly complete swelling of wood in *n*-butyl alcohol required 120 days. The solutions of potassium sulfate and of lithium, sodium, potassium, magnesium, calcium, and manganese chlorides increased the crushing strength as compared with that of water-treated wood. Potassium bromide very slightly increased the strength. Potassium thiocyanate and potassium iodide distinctly decreased the strength. In the organic group, urea, resorcinol, and pyrogallol, which caused a relatively high degree of swelling, markedly decreased the crushing strength, whereas chloral hydrate, which also swelled the wood strongly, and tannic acid, which caused little swelling, increased the strength decidedly.

**Electric motors for the farm (single phase),** H. H. Beaty and W. A. Thomas (*Iowa Sta. Bul. P13, n. ser. (1940), pp. 361–390, figs. 17*).—This bulletin deals only with A. C. (single phase) motors, except for brief mention of the

universal type, and discusses the smaller motors, from ⅙ to 7½ hp., which may be operated on such current.

As a guide to the selection of a motor suitable for the work to be done, attention is called to the differences in starting torque, in the percentage of overload which can be brought up to speed, and in the percentage of overload carried without stalling, the common types being listed in order of increasing starting torque as split phase, capacitor start-induction run, capacitor run, repulsion start-induction run, and repulsion induction. Two portable motors, the one of from ¼ to ½ hp., the other of from 3 to 7½ hp., are recommended for machines used seasonally, these being considered capable of operating practically all farm machines not supplied with an attached motor. Individual motors are recommended for machines used daily, such as water pumps, cream separators, milking machines, etc.

To promote efficiency and to prolong motor life, line-shaft drives are to be avoided, pliable belts are to be preferred to stiff or heavy belts, attention should be given to belt speed so that speeds greater than 4,000 ft. per minute will not be used, and special fuses (delayed action to permit momentary heavy starting currents) or cut-outs are to be used for preventing excessive overload. Lubrication and the need for keeping the motor clean and dry are also dealt with, together with the importance of a current supply not more than 10 percent higher or lower in voltage than that for which the motor is designed.

The general advantages of electric motors over manual operation or other sources of power are pointed out.

**Remodeling used machinery for tractor farming,** L. F. LARSEN (*South Dakota Sta. Cir. 30 (1940), pp. 15, figs. 12*).—Several adaptations of machines designed to be horse-drawn to permit their use with tractors are described and illustrated by diagrams and photographs.

Using a stub tongue to attach the first of two binders directly to the tractor drawbar and a tongue truck on the second binder, the operator can hitch the two machines to work in combination by means of two chains or cables. The longer of these chains or cables must be passed through two slip joints under the front binder (an ordinary clevis can be so attached as to serve this purpose), and the evener bracket on the second binder must be removed, lengthened to about 32 in., and replaced inverted, bringing the end nearer the ground.

To provide for windrowing and drying in the windrow before using a combine, the author rebuilt an old binder into a right-hand windrower, suitable for preparing the grain for a combine having right-hand pick-up. It is also pointed out that any farmer who has an old header available will find that it makes a very good windrower for a right-hand combine by merely removing the elevator.

**Cotton-tillage studies on Red Bay sandy loam,** J. W. RANDOLPH, I. F. REED, and E. D. GORDON. (Coop. Ala. and Miss. Expt. Stas.). (*U. S. Dept. Agr. Cir. 540 (1940), pp. 55, figs. 34*).—Seedbed preparation experiments, planter tests, cultivation experiments, and a study of the relation between apparent specific gravity and crop yield are separately dealt with.

With respect to seedbed preparation, the desirable physical condition at planting time for Red Bay sandy loam was found to be that of a relatively low apparent specific gravity with about one-third of the top 8 in. of soil in soft clods embedded in settled, finely granulated soil. The structure should be such that the soil will not settle to a high apparent specific gravity by fall. With seed, fertilizer, and methods of planting and cultivation kept constant, the 6-yr. average yields varied, due to seedbed preparation methods, from 1,038 to 1,324 lb. of seed cotton per acre. Plats receiving no seedbed preparation produced an average of 1,100 lb. per acre.

Preparation of the seedbed by plowing or breaking the row and then the middle in winter not only produced the best yields but released labor in the spring for handling feed and food crops. Excessive tillage in seedbed preparation did not increase the yield per acre much above that obtained when there was no seedbed preparation. A loose, overpulverized, structureless condition was produced in the surface soil, which consolidated rapidly after the normal spring rains. These operations tended also to pack the subsoil, producing an impervious layer which prevented development of a normal root system, slowed up drainage, and increased erosion. Maximum yields per acre and returns per man were obtained by use of a few properly executed, well-timed operations. The tillage work under the row was found to be more beneficial than work done in the middles if the soil is not overpulverized. Yield increased with the depth of work under the row down to 8 in. Subsoiling did not increase the yields. Deep plowing gave the best control of weeds. Shallow working or ridging the soil did not cover weed seed deep enough to prevent their germination. Tillage methods that increased the moisture-holding capacity of the soil tended to increase yields.

The planter tests showed that the machine must have weight, strength, and contact with the ground sufficient to hold the opener to the desired depths in the soil, and that a sweep mounted on the front of the planter to cut the bed to the desired height improved the yield of seed cotton, removed weeds and trash from the row, and made possible a better first cultivation. The variable-depth method of planting practically insured a stand of cotton on the first planting even under the very unfavorable conditions often encountered in early spring, giving better stands where soil crusts formed than did planting at constant depth because conditions favorable for development of crusts caused seed planted shallow to germinate and emerge before the crust was fully formed. The seed press wheel helped to insure a quick stand, but tended to reduce yields. It is not recommended for the conditions encountered in this experiment. A surface press wheel should be used throughout the season. The open-type wheel gave best results when the soil was inclined to crust, but the closed or solid-tire type was best under certain dry conditions. The covering spoons or disks should be arranged to throw a uniform amount of soil onto the row.

The cultivation experiments showed that cultivation should be shallow and only frequent enough to control weeds. Cross-row cultivation with drag harrow, spring-tooth weeder, or rotary hoe controlled the weeds, removed weak plants, and lengthened the chopping period, allowing hoe hands to select the better plants to leave for stand. Cross-row cultivation can be done economically as the equipment used handles a relatively wide strip and has light draft. It may be destructive to cotton planted on very loose beds or in a furrow. The same three tools were found very effective for breaking soil crusts to allow cotton seedlings to come up. The rotary hoe seemed most satisfactory. Cross-row cultivation before and during chopping time followed by enough shallow-row cultivations to keep down the weeds produced the maximum yield of seed cotton and was efficient in the use of labor.

Apparent specific gravity, measured by drying and weighing fixed portions of a core sample taken with a thin-walled steel tube and determining the required figure from the weight per unit volume, showed that the type, number, and time of the seedbed-preparation operations substantially altered the compactness at certain depths. The data indicate close correlation between yield and apparent specific gravity for certain ranges of depth in the row area, especially between 4 and 8 in. in the top 2 in., because of cultivation. The average apparent specific gravity of the soil in the cotton row was found to be less after harvest than

in the period immediately following planting. This loosening is attributed in part to the permeation by roots and in part to the alternate wetting and drying of the soil through the growing season.

**Cotton picking machinery: A short list of references**, E. L. Day (*U. S. Dept. Agr., Bur. Agr. Econ., Econ. Libr. List 9 (1940), pp. 19*).—This reference list, superseding three previous typewritten lists, was compiled mainly from *Agricultural Economics Literature* (vol. 1, 1927, to vol. 13, 1939) and *Cotton Literature* (vol. 1, 1931, to vol. 9, 1939). A brief indication of the nature of each article cited is given.

**Sources of heat for cotton drying**, C. A. Bennett, V. L. Stedronsky, and W. J. Martin (*U. S. Dept. Agr., Misc. Pub. 385 (1940), pp. 23, figs. 19*).—The advantages to both producer and ginner derivable from drying cotton before ginning are briefly summarized, and figures showing the increasing use of driers (800, handling nearly 1,000,000 bales in 1938, as against only 15 driers handling about 25,000 bales in 1931) are stated.

Of the 3 heat sources now used, a survey made in 1938–39 showed 73 percent of the driers reported upon using steam heat, 20 percent using air-heating furnaces, and 7 percent using waste heat from engines. The nature of the equipment needed for the use of these 3 sources of drier heat is discussed, and cost per bale, advantages and disadvantages in operation, and other characteristics are indicated for each method. Fuel for drying by steam heat is estimated to average a little over 16 ct. per bale, for an air-heating furnace about 12 ct., and for engine waste heat, both that from the engine cooling water and that from the exhaust gases being utilized, slightly less than 6 ct. per bale. In connection with the last-named source of heat, however, it is noted that there will often be need for a supplementary source of heat. Combinations of engine heat with other air-heating equipment are described and illustrated by photographs, diagrams, and, in part, by dimensioned drawings. Numerous experimental observations and recommendations with respect to economical and efficient set-up and operation are given in connection with the various forms of drier equipment dealt with.

**Dehydrated and sun-cured hay**, S. I. Bechdel, A. W. Clyde, C. O. Cromer, and P. S. Williams (*Pennsylvania Sta. Bul. 396 (1940), pp. [2]+24, figs. 8*).—For artificial drying of hay, both rotary drums and conveyor machines were tested. To accelerate field drying, experimental crushers, cracking stems by passing the freshly cut hay between rolls, were tried with encouraging results. The bulletin also reports results of feeding experiments with dairy cattle showing the superiority of artificially dehydrated hays over field-cured or silage products.

The drum drier used feeds the chopped hay material into a current of hot gases and heated air drawn from the furnace into the innermost of three concentric drums, to pass backward between the innermost and the second drum and forward again between the second and outer drum to the outlet of the exhaust fan. This machine evaporated, at its rated capacity, 1 ton of water per hour, producing ⅜ ton of dried hay (about 12 percent moisture content) from freshly cut alfalfa of 75 percent moisture content or ¾ ton from partially dried material of 60 percent moisture content. The exhaust fan could be operated successfully at somewhat less than 1,100 r. p. m. instead of the recommended speed of 1,350 r. p. m. with a decrease in exhaust-heat loss and in exhaust-fan power consumption. Fairly complete data from a 7½-hr. run are tabulated. The conveyor drier, of the countercurrent type, passes the furnace gases first through a long tunnel under the drier and through a screen to prevent sparks from reaching the hay, and then back against the motion of the conveyor, baffles

causing the gases to pass alternately upward and downward through the mat of hay. The freshly cut material for this drier is chopped at 1½ in. and distributed in a layer of uniform thickness by a mat-forming device. The thermal efficiencies of the conveyor machines were 63 percent for the smaller and 65 percent for the larger, as against 67 percent found for the concentric drum type.

It is believed that the cost of dehydration, including all overhead, will vary between $5 and $10 per ton. Fuel oil can be burned with better efficiency and automatic control but the local coal production makes coal usually the cheaper fuel in Pennsylvania. It is concluded that large initial investment, the lack of small movable driers compelling cooperative ownership, and the necessary haulage of green forage and hay render the total cost too high to permit dehydrated hay to compete with sun-cured hay in dairy feeding. Dehydrated alfalfa, however, even at a cost much higher than sun-cured alfalfa, is much in demand for poultry rations. The supply of dehydrated alfalfa has never exceeded the demand in this country.

The experimental crusher described passes the cut forage material between rolls, cracking the stems lengthwise with very little effect on leaves, and drops the crushed hay to the ground for natural drying. Hay so treated dried enough for storage in about 1 day less than the usual curing time. The crushed hay dried no faster in the artificial driers than the untreated material, but the crushing treatment is considered to have some advantage when partial field drying is to precede artificial dehydration. Crushing soybean hay reduced the field drying time from 17 to 5 days and resulted in a better product. It is expected that a practical crusher will be on the market soon.

**The effect of position in the bin and temperature differentials on loss of weight of potatoes in storage** (*New Hampshire Sta. Bul. 319 (1940), p. 30*).—Data are reported from a study of three types of air intake for the ventilation of potato bins, by O. R. Butler and P. T. Blood.

**Experiments with new electric devices for pasteurizing soils, A. G. Newhall** (*[New York] Cornell Sta. Bul. 731 (1940), pp. 38, figs. 21*).—Consideration of the thermal death points of more than 120 plant-pathogenic microorganisms, coupled with practical soil tests, led to the conclusion that a final soil temperature of 65° C. (149° F.) is a sufficient pasteurization to kill all important plant pathogens and most weed seeds.

Ordinary soil-heating cable failed to withstand the temperature required for soil-pasteurization work. An induction type of electric pipe grid was found too costly, both in material and labor. Soil in greenhouse benches and ground beds was brought up to pasteurizing temperatures with a series of buried portable pipe-type heaters, of 0.75-in. galvanized pipe, having a rating of approximately 100 w. per linear foot and spaced to give from 220 to 400 w. per cubic foot of soil. These, however, must be buried, dug up, and reset at frequent intervals, and attention was turned to the possibility of generating steam with electric heating units close to the soil but not buried in it. A portable, electrically operated, inverted steam pan, with which pasteurizing temperatures in bench and ground-bed soil were obtained to a depth of from 7 to 10 in. in 2 hr. with the expenditure of approximately 1.5 kw.-hr. per square foot of soil, appeared to have promise as a means of treating coldframe, hotbed, cutting-bench, seedbed, and slat-house soil while in place.

Successful use was made of the new Nixon electric dairy-utensil steamer for pasteurization of soil in flats, or trays. In a series of more than 250 test runs it was shown that pasteurizing temperatures could be obtained in from 2 to 3 hr. at an expenditure of approximately 1.37 kw.-hr. per cubic foot of soil treated. No appreciable pressure of the steam generated is necessary for adequate soil

treatment. A continuous or semiflash type of electric soil pasteurizer was tested. In this device the soil is placed in a hopper at one end and discharged 5 min. later from the other end, having attained a temperature of from 65° to 80° C. on its way through at an expenditure of 1.5 kw.-hr. per cubic foot of soil treated.

**Poultry equipment, H. H. Alp.** (Coop. U. S. D. A.). (*Illinois Sta. Cir. 506 (1940), pp. 20, figs. 32*).—In this revision and extension of Circular 333 (E. S. R., 60, p. 882), suggestions for the construction of the following devices are accompanied by dimensioned drawings: Simple chick feeders, indoor hen feeders, weatherproof range feeder, open nests, and roosts and droppings board or pit. Other equipment, discussed and shown in photographs or in drawings without dimensional detail, comprises chick roosts and brooder, outdoor wire pens, movable roosting shelters, shade shelters, catching crate, egg storage cellars, trap nests, range watering device, range watering system, heater for water trough, electric water heater, broody coop, and screen platform. The circular deals with models and types of equipment that are simple to construct and have proved their worth in everyday use on poultry farms in Illinois.

**Equipment for burning sulfur in empty greenhouses and in mushroom houses for the destruction of mites and insects, O. K. Hedden and C. R. Neiswander.** (Coop. U. S. D. A.). (*Ohio Sta. Bimo. Bul. 204 (1940), pp. 63–72, figs. 8*).—The authors describe apparatus which can be constructed from steel barrels, the simpler of the two devices being a natural-draft burner which must be placed inside the building to be fumigated. Sulfur trays with suitable perforated bottoms are set one above and one below a charcoal-burning grate in which briquets are used. Placing two or three burning briquets in each of the two sulfur trays was found desirable to insure prompt ignition of the sulfur. A 50-lb. sulfur charge was found to be best burned when 35 lb. were placed in the upper and 15 lb. in the lower tray. Such a burner required a metal shield between it and any nearby woodwork to obviate fire hazard.

A forced-draft burner of similar construction could be supplied with sufficient air (a fan delivering about 250 cu. ft. per minute being recommended) by a ½-hp. gasoline engine or electric motor. This device gave better control, lessened fire risk by placing the combustion chamber entirely outside of the building, and permitted adding more sulfur through a funnel fitted into the top of the burner. The sulfur dioxide from this burner was blown into the building through a suitable length of 6-in. stovepipe ending in a T with screen-covered openings. It was necessary to provide a movable baffle plate capable of being turned in front of the air inlet after the sulfur began burning rapidly, since exposing the burning sulfur to the direct draft burned or melted the metal trays. Construction of the forced-draft burner necessarily involves some welding. Drawings adequate for the construction of both types of burner are included.

The build-up of sulfur dioxide concentration was determined at the upper and lower bench levels in two experiments and at two points nearly at the same level in a third experiment, the data being presented in three graphs. Concentrations lethal to red spiders and their eggs were secured at all points where test leaves infested with these pests were placed, but the chemical determination of the concentrations attained and of the rates at which the concentration rose and fell indicated a necessity for the very careful closing of all openings, especially those in the upper part of the building. Despite the fact that sulfur dioxide is heavier than air, it was shown to be more difficult to secure high concentrations of the gas in the lower than in the upper part of the structure under fumigation. It was concluded that 3 lb. of sulfur per 1,000 cu. ft. should produce a concentration of sulfur dioxide amply sufficient to kill all forms of mite and insect life.

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**Plans of farm buildings for Southern States.** (Coop. land-grant colleges of Ala., Ark., Fla., Ga., La., Miss., N. C., Okla., S. C., Tenn., Tex., and Va.). (*U. S. Dept. Agr., Misc. Pub. 360 (1940), pp. 123, figs. 124*).—Dwelling houses, barns, and shelter, storage, and work buildings are covered. The plan, a section, and a sketch of the completed structure are accompanied in each instance by a brief description and a reference number to be given in ordering the working drawings through the county agricultural extension agent or the extension agricultural engineer at the cooperative land-grant college or university.

## AGRICULTURAL ECONOMICS

**[Papers and notes on agricultural economics]** (*Jour. Farm Econ., 22 (1940), No. 2, pp. 411–497, figs. 5*).—Included are the following papers: Training and Recruitment of Agricultural Economic Personnel—I, A General View, by H. C. Taylor (pp. 411–414), II, The Civil Servant, by F. V. Waugh (pp. 415–417) (U. S. D. A.), and III, The South, by R. J. Saville (pp. 418–420) (La. State Univ.); Agricultural Labor and the Fair Labor Standards Act of 1938, by H. W. Hannah (pp. 421–429) (Univ. Ill.); A Desirable Foreign Trade Policy for American Agriculture, by J. S. Davis (pp. 430–439); An Application of Analysis of Covariance to Price-Quality Relationships of Eggs, by L. E. Cron (pp. 440–445) (Univ. Md.); Export-Dumping Plans, by F. L. Thomsen (pp. 446–459), and Role of Soil Depletion in Land Valuation, by D. B. Ibach (pp. 460–472) (both U. S. D. A.); County Planning for Land-Use Adjustment, by J. G. Crawford and G. Lange (pp. 473–483); and On Agricultural Policy, by R. R. Renne (pp. 484–492) (Mont. State Col.). Notes are included as follows: Federal-State Relationships in Agriculture, by O. B. Jesness (pp. 493–495) (Univ. Minn.); and Memory Errors as They Affect Survey Data, by O. Brownlee (pp. 495–497), and Market-Sharing in the Packing Industry—A Correction, by W. H. Nicholls (p. 497) (E. S. R., 83, p. 405) (both Iowa State Col.).

[**Economic Library Lists 5–8, 10–12**] (*U. S. Dept. Agr., Bur. Agr. Econ., Econ. Libr. Lists 5 (1939), pp. 8; 6, pp. 13; 7, pp. 3; 8, pp. 13; 10 (1940), pp. 11; 11, pp. 58; 12, pp. 4*).—No. 5, Acts Administered by Agricultural Marketing Service, by M. E. Wheeler, is a list of acts administered by the Agricultual Marketing Service of the Department.

No. 6, Periodicals Relating to Shipping, by E. M. Colvin and N. G. Larson, includes 57 references to periodicals containing information on foreign, coastal and intercoastal shipping, and commerce of the United States, Canada, Argentina, Brazil, India, Australia, and South Africa.

No. 7, Electrical Properties of Cotton—Some References to the Literature, January 1931–October 1939, by E. L. Day, includes 7 references.

No. 8, Sea Island Cotton—Selected References, by E. L. Day, includes 92 selected references covering the United States, the West Indies, and other countries.

No. 10, The Tomato Industry in Puerto Rico and Cuba—A Short List of References, by H. E. Hennefrund, includes 47 selected references.

No. 11, The Dairy Industry in the United States—Selected References on the Economic Aspects of the Industry, by L. O. Bercaw, includes 323 selected references on the economic aspects of the dairy industry in the United States, mainly issued from January 1939 through June 1940.

No. 12, Planning for the Farmer—A Short Reading List of Free and Inexpensive Material, is a list of 25 free or inexpensive bulletins, articles, etc., on the farm, community, county, State, and nation.

**[Investigations in agricultural economics by the Massachusetts Station]** (*Massachusetts Sta. Bul. 369 (1940), pp. 5, 6, 44, 45*).—Results of studies not

previously noted are reported as follows: (1) Receipts and labor income on dairy farms, by C. R. Creek and E. Rauchenstein, (2) cost of production and labor used per acre in producing set onions on 25 farms in 1938, by Creek and C. Bokina, (3) man-hours used in packing celery on 15 market-garden farms, by Creek and R. Elliott, and (4) findings as to the land uses in Worcester County, by D. Rozman.

**[Investigations in agricultural economics by the Nebraska Station, 1939]** (*Nebraska Sta. Rpt. [1939], pp. 49–52, 56*).—In addition to results previously noted, brief statements are included as to the average cost per 100 lb. 1930–35 for shipping hogs to Omaha, and the cost in 1939 of pumping water for irrigation at the North Platte Substation, the cost of irrigating, and the increased yields of potatoes, corn, and Atlas sorgo.

**[Investigations in agricultural economics by the New Hampshire Station, 1939]** (*New Hampshire Sta. Bul. 319 (1940), pp. 12–18*).—In addition to results previously noted, statements of findings are included on (1) the ownership and use of lands in Grafton County, (2) results and costs of clearing pasture plats by burning, pulling, and cutting brush, and (3) practices, economies available and utilized, and possible adjustments in purchases by farmers.

**[Investigations in agricultural economics by the Ohio Station]** (*Ohio Sta. Bimo. Bul. 204 (1940), pp. 85–88, 96–98, 112*).—Included are articles on Operating Costs of Portable Sprayers, by C. W. Ellenwood, analyzing the cost of spraying with three different portable sprayers used by the station during the period 1925–39, and on Difficulties Faced By Cooperatives in Marketing Poultry and Eggs, by C. G. McBride and R. L. Baker, based on a survey of poultry and egg cooperatives. The table of index numbers of production, price, and income, by J. I. Falconer (E. S. R., 83, p. 257), is brought down through March 1940.

**An economic background for agricultural research in Puerto Rico, E. B. Hill and S. L. Descartes** (*Puerto Rico Col. Sta. Bul. 51 (1939), pp. [4]+61, figs. 10*).—This is a description and discussion of the general economy of the island, with particular reference to agriculture and its problems. The several sections deal with exports; imports; industrial employment; physical, social, and economic factors; land use; commercial cash crops; food supply, and the creation of small farms. English and Spanish summaries are included.

**Land use planning under way** (*U. S. Dept. Agr., 1940, pp. III+48, figs. 10*).—The Mount Weather agreement of 1938 between the Department and the State land-grant colleges to sponsor land planning by farmers, the organization and functioning of the State, county, and community committees, and some of the results of county land planning in different States are described.

**Tailoring conservation research to fit the needs of farm planning, N. W. Johnson** (*U. S. Dept. Agr., Bur. Agr. Econ., 1940, F. M. 9, pp. [1]+11*).—This is a brief discussion of the planning and presentation of the results of research in conservation for use in farm planning.

**Agricultural land-use planning in the Territory of Hawaii, 1940, J. W. Coulter** (*Hawaii Univ., Agr. Ext. Bul. 36 (1940), pp. 124, figs. 33*).—This monograph is a partial revision of the bulletin previously noted (E. S. R., 70, p. 850). The background of the problem of land planning in the Islands, the major aspects of land utilization for agricultural purposes, and the important phases of land-use planning are discussed.

**Planning minimum sized farms for the Beadle County area in central South Dakota, J. L. Paschal, A. G. Nelson, and O. Rogeness.** (Coop. U. S. D. A.). (*South Dakota Sta. Bul. 341 (1940), pp. 63, figs. 5*).—Some of the more important problems and means of increasing the stability of the agricultural economy of the area are analyzed with a view to determining a type and minimum size of farm that will support an average family over a period of years and to

suggesting policies that will assist farm operators, landlords, and public agencies in developing and maintaining a desirable type of agriculture. The topography, soils, climate, crop production, etc., of the area and the development of Beadle County are described. The planning and operation of farms in the area are discussed. The situation in Vernon and Richmond townships in 1937—number, tenure, mobility, financial status, age, etc., of farm operators, family situation, land ownership and use, future land use, farm organization and equipment, etc.—is described.

**The place which agricultural economics should occupy in a program of development for the South** (*Conf. Agr. Econ., Chattanooga, 1939, Proc., pp. [5]+69, fig. 1*).—Included are the discussions at a conference of deans, directors, members of the staffs in agricultural economics, etc., of the southern State agricultural colleges, the General Education Board, and others held at Chattanooga, Tenn., June 8–13, 1939, on content of courses for training in agricultural economics; considerations in outlining a program of research in agricultural economics; allocation of work; faculty development and recruiting; graduate student selection, preparation, time, and amount of aid; and institutional cooperation for a program of development in agricultural economics.

**Production responses of dairy farmers in east-central Minnesota,** E. G. Strand and E. Hole. (Coop. Minn. Expt. Sta.). (*U. S. Dept. Agr., Bur. Agr. Econ., Farm Mangt. Rpt. 6 (1940), pp. 71, figs. 10*).—The physical characteristics, agricultural development, and type of farming in the area are described. The annual variations in certain physical and economic factors and their effects on crop, livestock, and butterfat production are discussed. A detailed analysis is made of the production responses of 54 representative dairy farmers during the period 1927–37.

**The cutover region of Wisconsin** (*Wis. State Planning Bd. Bul. 7 (1939), pp. [11]+146, pls. 13*).—This is a report on conditions in the area, with recommendations for rehabilitation. It deals with general conditions; property tax base, county zoning ordinances, public land ownership, and tax delinquency; agriculture; forestry, recreation, and wildlife; mineral resources, industry, and water power; schools and school administration; local government, taxation, and grants in aid; unemployment and relief; the measures proposed for rehabilitation, operating agencies, problems, etc.; and the organization and membership of the Northern Lakes States Regional Committee.

**Philippine agriculture, a problem of adjustment,** O. L. Dawson (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr., 4 (1940), No. 7, pp. 381–456, figs. 20*).—Part 1, Resources and Historical Development—Problems of Future Economy, summarizes the resources, historical development, and problems of future economy, and part 2, Commodity Studies, discusses the present position of different agricultural commodities with regard to future prospects.

**Tobacco trade with Latin America,** J. B. Gibbs (*U. S. Dept. Agr., Off. Foreign Agr. Relat., 1940, F. S. 82, pp. 9*).—The production, consumption, exports, and imports of tobacco and tobacco products by Mexico and the countries of Central America, South America, and the West Indies, and the United States' exports to and imports from these countries are discussed.

**Cost of production and price margins for Long Island potatoes, 1939,** R. L. Margolin (*N. Y. City Dept. Invest., Studies Munic. Prob., No. 2 [1940], pp. [1]+VIII+39*).—Analysis is made of marketing through regular wholesale channels and through the farmers' section of the Wallabout market, New York City, July 1, 1939, to January 15, 1940. The average cost of production was 95 ct. per 100 lb.; the margins in selling through wholesale channels were farmer 26 ct., country dealer 37 ct., wholesaler 12 ct., and retailer 90 ct.; and through the farmers' market 60 ct. and retailer $1.05.

**Ten-year cost study, production of fluid milk, region of Montreal, R. Lecuyer** (*Quebec: Dept. Agr., pp. [1]+22*).—This study, made by the survey method, covers the period 1929–38, inclusive, and had for its purpose the determination of the items and total costs and their variations for different herds, the relation of different factors to total costs, etc.

**Cost of transporting milk and cream to Boston, L. T. Sonley.** (Coop. U. S. D. A. et al.). (*Vermont Sta. Bul. 462 (1940), pp. 56, figs. 20*).—The evolution of transportation facilities and rate structures for milk, the trends in methods of transportation of milk, 1930–39, the variations in service included at different rates, and the costs of such services and other factors affecting costs of transportation are discussed. A comparison is made of truck and rail rates in effect September 1, 1939.

Rail rates were increased approximately 75 percent from 1916 to 1932. Since 1932 reductions totaling approximately 75 percent of the previous increases have been made. During the last decade the principal changes in the transportation in the Boston milkshed were an increase in receipts of cream from midwestern points from 16 to 32 percent of the total receipts, the practical disappearance of less than carlot shipments, a marked shift from rail to truck shipments, and a great increase in the use of tank cars. It is estimated that in 1939 45 percent of the milk and 26 percent of the cream were transported by truck, and that 86 percent of the rail shipments and 21 percent of the truck shipments were handled in tanks.

**Short-term credit for agricultural production in South Carolina, W. T. Ferrier** (*South Carolina Sta. Bul. 327 (1940), pp. 40, figs. 4*).—In cooperation with the Farm Credit Administration approximately 842 farm operators were interviewed and additional information obtained from 500 cash-borrowing owners, part-owners, and tenants, 62 sharecroppers, 17 banks, 8 other lending agencies, and 12 merchants in 5 counties of the State. The records included 14 from Negro operators. In addition records of cash borrowing of 108 Negro farmers obtained by the South Carolina Agricultural and Mechanical College for Negroes and 36 records of white users of short-term credit in undesignated counties were used. The extent and size of short-term loans, the amount of loans and sources, the purpose for which the credit was used, amounts of merchant credit, installment purchasing, cash on hand at the beginning of the crop season, seasonality of credit needs, length of loans, interest charges and amount of budgetary loans, and security requirements are analyzed. The comparative costs of bank and production credit association credit, splitting the line of credit, adequacy of production credit, the coordination of credit activities, and the existing credit facilities are discussed. Comparisons are made with the findings in the study made in 1926 (E. S. R., 67, p. 615).

Approximately 60 percent of the farmers borrowed for crop or livestock production, about $13,000,000 being borrowed in 1937. Credit supplied by merchants decreased from 31.6 percent in 1926 to less than 10 percent for white operators in 1937. Installment purchases constituted 4.1 percent of all purchases. Approximately 88 percent of the production credit was used for cash payments for fertilizers and farm operating expenses. Of the 500 cash borrowers, 25 percent had no cash on hand at the beginning of the crop season. The average cash reserves were owners $277, part owners $361, and tenants $114. The greatest number of loans were made from March 1 to 15, and were paid between October 1 and 15, the average term being 7.1 mo. The average rates of interest were production credit associations 4 percent, Farm Security Administration 5 percent, banks 7 percent, and individuals from 4 to 20 percent. Slightly over one-third of the loans of production credit associations were on the budget plan. Livestock and crop security was most often pledged, but most production credit

associations required all farm equipment also. The percentage of bank loans secured by crops or livestock increased from 34 percent in 1926 to 78.1 percent in 1937. Due to the service charges of the associations, loans of $300 or less were usually obtained more cheaply from banks than from production credit associations. There were adequate loanable funds and credit facilities for farmers who could meet the security requirements of banks and production credit associations.

"The existence of three Federal or Federally supervised short-term agricultural credit agencies confuses many farmer borrowers and their separate operation leads to some duplication of field and office activities. Since crop and feed loan offices, production credit association, and Farm Security Administration offices are all under the administration of the Secretary of Agriculture, a more efficient coordination of their lending activities should be possible."

**Sharecroppers and wage laborers on selected farms in two counties in South Carolina**, E. J. Holcomb and G. H. Aull. (Coop. U. S. D. A.). (*South Carolina Sta. Bul. 328 (1940), pp. 70, figs. 4*).—This study was made to ascertain the amount of shift in tenure status between sharecroppers and wage laborers, the effects of such shift, the factors asosciated with the shifts, and prospective shifts. The two counties, Laurens and Florence, were selected as typical of the upper Piedmont cotton area and the lower Coastal Plain tobacco and cotton area, respectively. The analysis is based chiefly on the records obtained by personal interviews with 105 farm operators, 70 sharecroppers, 31 wage families, and 10 single wage hands in Laurens County, and 61 operators, 79 sharecroppers, 44 wage families, and 14 single wage hands in Florence County selected at random irrespective of cooperation with the soil conservation and domestic allotment program. The historical development of the sharecropper and wage-labor systems, the advantages of each to the laborers and the farm operators, the effects of soil conservation and domestic allotment programs, and farm organization on the farms surveyed are described. An analysis is made for each county of the income of sharecroppers and wage laborers in relation to family composition and days worked, home-use goods and perquisites, income by income groups, seasonal distribution of employment, credit arrangements (croppers only), trends in economic status, mobility, preference between the systems, etc. Sharecropper land use, economic advantage of each type of labor, and means of improving income of each type of labor are discussed.

Some of the findings and conclusions were: From 1933 to 1937 the net changes in the numbers or tenure status in both counties were insignificant, and those that occurred were closely related in direction but not in magnitude with the program of the Agricultural Adjustment Administration. The economic status of both classes was more closely related to size of family and its working force than to tenure status insofar as cash income is concerned. A change from sharecropping to wage labor results in a rather sharp decline in the family income from home-used goods and perquisites. The income of both groups could be increased greatly by increased production of home-used goods. A very marked change in wage rates in relation to prices of cotton and tobacco will be necessary before the income of wage families, including home-used goods and perquisites, will equal that of sharecroppers.

"Until the technology of cotton and tobacco production is greatly improved, farmers in these areas will find little encouragement to make complete shifts to the use of wage laborers in lieu of sharecroppers."

**American cooperation, 1939** (*Washington, D. C.: Amer. Inst. Coop., [1939], pp. XII+695, figs. [6]*).—Included are the papers presented at the fifteenth summer session of the American Institute of Cooperation held August 7–11, 1939,

on cooperation and Federal policy in the national economy, intergroup cooperation, education in cooperation, public relations and publicity, and cooperative marketing of dairy products, grain, livestock, poultry and eggs, and fruits and vegetables, and cooperative purchasing of farm supplies.

**Development of cooperative cotton ginning,** O. W. HERRMANN (*Farm Credit Admin.* [*U. S.*], *Coop. Res. and Serv. Div., Cir. C-112* (*1939*), *pp.* [*2*]+*11*+*68*, *figs. 11*).—The development of local cooperative gins in Oklahoma, southeast Missouri, Texas, New Mexico, Arizona, Mississippi, and California, the organization structure and operating policies and the gin programs of such associations, and the associations of local cooperative gins in Oklahoma and Texas are described and discussed.

**Cooperative marketing of livestock at Cincinnati by the Producers Cooperative Commission Association,** H. H. HULBERT (*Farm Credit Admin.* [*U. S.*], *Coop. Res. and Serv. Div., Bul. 34* (*1939*), *pp. VI*+*130*, *figs. 24*).—The development and structure of the association, the major trends in receipts, the field services and educational activities, the handling of complaints, sales policies, branch operations, etc., of the association, and the significance of transportation to cooperative marketing of livestock are discussed. An appendix includes statistical data.

**Livestock auction sales in the United States,** C. G. RANDELL and L. B. MANN (*Farm Credit Admin.* [*U. S.*], *Coop. Res. and Serv. Div., Bul. 35* (*1939*), *pp. VIII*+*116*, *figs. 28*).—The development of livestock auctions in the United States, the plant equipment, operating methods, financial responsibility, statutes and regulations governing such auctions, and the viewpoints of producers and others toward these auctions are discussed, and an appraisal of the advantages and disadvantages, etc., is made. Appendixes include copies of operating forms in use and a brief summary of the reorganization and regulation of livestock markets in the British Isles.

**Base allotment or quota plans used by farmers' cooperative milk associations,** W. C. WELDEN and L. F. HERRMANN (*U. S. Dept. Agr., Farm Credit Admin., Coop. Res. and Serv. Div., Misc. Rpt. 23* (*1940*), *pp.* [*3*]+*41*).—"This report deals briefly with experiences in selected milk markets in the use of allotment or quota plans." The historical development of base or quota plans, the variations between markets, types used in selected markets, and the operating results of base plans are described and discussed.

**Butter marketing by cooperative creameries in the Middle West,** P. E. QUINTUS and T. G. STITTS (*Farm Credit Admin.* [*U. S.*], *Coop. Res. and Serv. Div., Bul. 36* (*1939*), *pp. VI*+*66*, *figs. 12*).—The importance of cooperative creameries, the market outlets for butter, sales to patrons, local sales, outlets for shipped butter, direct sales to central markets, sales through country concentration plants, the special services of cooperative regional sales agencies, packaging and transportation of shipped butter, and the selection of marketing outlets and selling arrangements are described and discussed.

**Financial results of the operations of farmers' elevators in Illinois in 1938 and 1939,** L. J. NORTON and G. W. FREEMYER (*Illinois Sta., 1940, AE-1445*, *pp.* [*1*]+*30*, *figs. 2*).—This publication supplements that previously noted (E. S. R., 78, p. 269). Records of 83 companies in 1938 and 106 companies in 1939 were studied.

The average rate of earning on total assets was 8 percent in 1938 and 11 percent in 1939. The earnings per bushel for companies with more than 90 percent of their business made up of grain were corn 1.9 ct., oats 3 ct., and soybeans and wheat 3.8 ct. The average gross earnings on merchandise were 13.8 percent in 1939 and 12.4 percent in 1938. In both years the average cost of handling grain,

including 6 percent on net worth of business, was 1.7 ct. per bushel. The average net return in 1939 was 0.55 ct. In 1939, 66 companies paid or authorized dividends on stock and 28 paid patronage dividends.

**North Dakota farm prices, W. L. Ettesvold** (*North Dakota Sta. Bimo. Bul., 2 (1940), No. 6, pp. 18, 19*).—This series (E. S. R., 83, p. 553) is continued for May and June 1940.

**Reasons for differences in the price of apples received by Ulster County [New York] growers, 1937 crop, F. A. Harper** (*Cornell Univ., Dept. Agr. Econ. and Farm Mangt., 1939, AE-263, pp. 58, figs. 27*).—An analysis is made of the effects of variety, grade, size, time of sale, type of market outlet, by whom sales were made, kind of storage, and type of container on prices received, and of how growers marketed their crops.

**Statistical analysis of the annual average f. o. b. prices of canned apricots, 1926–27 to 1939–40, H. R. Wellman and R. S. Bylin** (*California Sta. Mimeog. Rpt. 72 (1940), pp. [1]+9, fig. 1*).—The average relationship between f. o. b. prices of canned apricots and the three factors studied were (1) a change of a million cases in domestic shipments was accompanied by a change of 40 ct. per case in the price in the opposite direction, (2) a change of 10 points in the index of nonagricultural income payments in the United States was accompanied by a 43 ct. change in price in the same direction, and (3) a change of 10 points in the adjusted price of competing fruits was accompanied by a 26 ct. change in price in the same direction.

**Statistical analysis of the annual average f. o. b. prices of Pacific Coast canned Bartlett pears, 1926–27 to 1939–40, H. R. Wellman and R. S. Bylin** (*California Sta. Mimeog. Rpt. 73 (1940), pp. [1]+9, fig. 1*).—Using $X_1$=annual average f. o. b. price per case of canned Bartlett pears, $X_2$=domestic shipment of Pacific coast canned Bartlett pears in millions of cases, $X_3$=index of nonagricultural income payments in the United States in percentage points, and $X_4$=adjusted index of prices of competing canned fruits in percentage points, the multiple linear regression equations fitted by least squares were: $X_1=-3.41687-0.30491X_2+0.05000X_3+0.03478X_4$ and $X_2=-2.49468-1.61200X_1+0.07455X_3+0.04312X_4$. The standard errors of estimate were $\bar{S}_{1.234}$ =\$0.201 per case and $\bar{S}_{2.134}$ =463,000 cases, and the adjusted coefficients of multiple correlation were $\bar{R}_{1.234}$ =0.968 and $\bar{R}_{2.134}$ =0.652. The linear relation between f. o. b. prices and each of the three factors are presented graphically, and show that if the other two factors are held constant on an average (1) a change of a million cases in domestic shipments was accompanied by a change of 30 ct. per case in the price in the opposite direction, (2) a change of 10 points in the index of nonagricultural income was accompanied by a change of 50 ct. in price in the same direction, and (3) a change of 10 points in the adjusted index of prices of competing canned fruits was accompanied by a change of 35 ct. in the price in the same direction.

## RURAL SOCIOLOGY

**Cooperative rural research, C. E. Lively.** (Univ. Mo.). (*Social Forces, 18 (1939), No. 2, pp. 200–210*).—The author discusses the historical development of cooperative rural sociological research in the United States.

**Natural increase in the population of New York State, W. A. Anderson** (*[New York] Cornell Sta. Bul. 733 (1940), pp. 22, figs. 8*).—The index of natural reproduction in New York State is 88, or 12 points below the index necessary for replacement. However, the total rural population of the State has a reproduction index of 120. The rural farm population is reproduced at the rate of 139 and the rural nonfarm population at the rate of 113.

It is concluded that New York will continue to be an area of absorption for excess population produced elsewhere. In 1930, 37.8 percent of its inhabitants were born outside the State. Mobility within the State is also likely to increase. As of 1930, only 97 men to every 100 women came to New York, while of those leaving New York State for other areas there were 103 men to every 100 women. The population moving into New York State is chiefly adult. The migration of excess population from the rural areas of population overproduction to the urban areas of underproduction means that the rural areas bear the cost of rearing and educating these persons for their productive use by the urban regions. Institutions and organizations in the rural areas, especially those of a voluntary type such as the church, suffer particularly from this migration, for the young people migrate just when they could begin to contribute support and leadership.

**Preliminary report on development of economic opportunities in Montana for migratory and stranded families** (*Helena: Mont. State Planning Bd., 1939, pp. [109, pls. 17]*).—This is an attempt to indicate the scope of the problem of migratory and stranded families in the State, its principal causes, its social and economic consequences, the adjustments which have been made to date, a statement of resettlement opportunities for migratory and stranded farm families in the State, and some recommendations and suggestions for the future. The report contains data on the number of migratory and stranded families in the State, an estimate of the number of opportunities of re-establishing such families on irrigated tracts, and the approximate cost of such rehabilitation.

**Migratory farm labor in the Western States**, P. H. LANDIS (*Wash. State Col. Res. Studies, 8 (1940), No. 1, pp. 45, 46*).—"The disorganizing forces of a transitional age have made their disrupting influences felt on the agricultural labor situation. Included among farm laborers are castaways of mechanized farming areas and of urban industrial centers; former farm owners, tenants, and sharecroppers who have been forced downward on the agricultural ladder; and youth, both those hoping some day to farm independently and those unable to find other employment. . . . The migratory farm worker exists because there is a seasonal demand for his services in intensive crop areas where the supply of local labor is insufficient. The situation in the Yakima Valley, Wash., is typical. Some 4,000 to 6,000 farm workers reside in the valley, yet 35,000 full-time workers are needed for the hop harvest during the second week in September; within 2 weeks the harvest is completed. A month later 12,000 workers are required for the apple harvest. By midwinter a total of only 500 workers is needed. Adding to the seasonal migratory labor problems has been the stream of migrants from the drought States in quest of employment. . . .

"Farm laborers as a group have benefited from few of the social protections which have been extended urban industrial workers through social legislation and welfare programs. . . . Government is beginning to take steps to improve the lot of farm workers in appreciation of the fact that this is a social rather than an individual problem."

**Forces influencing rural life: A study of a central Pennsylvania community**, M. E. JOHN (*Pennsylvania Sta. Bul. 388 (1940), pp. [2]+28, figs. 11*).—Howard community in Centre County was selected for study. Three periods are compared—1770–1875, 1875–1910, and 1910 to the present—economically and socially. A number of recommendations are made for more effective use of local resources and for social evolvement.

**Composition and characteristics of the population of rural relief households in South Carolina**, B. O. WILLIAMS and W. S. CRAWFORD (*South Carolina

*Sta. Bul. 326 (1940), pp. 32, figs. 13).*—This bulletin deals with the relief situation in South Carolina during 1935, presenting an analysis of the composition and characteristics of the population in rural households which received aid from the Federal Emergency Relief Administration. Included in the study were 3,430 rural relief households, containing 14,098 persons. Of the heads of these households, 41.4 percent were white and 58.6 percent were Negro; 59.4 percent were male. Among the whites, about 1 in every 7 of the heads had received no formal schooling, and 70.1 percent had attained not more than the seventh grade in school. Of the Negro heads of households, 46.9 percent had received no formal schooling, and three-fourths had attained less than fourth grade. Of all the heads, 65.2 percent were engaged in agriculture and 34.8 percent in nonagricultural occupations. Fifty-three percent of the heads had received direct relief, 38.2 percent work relief, and 8.8 percent both direct and work relief. Loss of employment was given as the reason why the largest number of cases went on relief. The study indicates that relief is tied up with the general social and economic conditions.

**Problems of rural youth in selected areas of North Dakota,** D. G. Hay, J. P. Greenlaw, and L. E. Boyle. (Coop. U. S. D. A.). (*North Dakota Sta. Bul. 293 (1940), pp. 67, figs. 14).*—This survey indicated that the total numbers and the proportion of youth in the population of North Dakota have reached an all-time high in a period when there is no longer any free land, when depression and drought have greatly reduced the agricultural income of the State, and when there is a scarcity of opportunities elsewhere. In an endeavor to improve their situation, somewhat less than half of the older youth left home, but most of those who left remained nearby where opportunities were probably little better than at home. Most of those who remained at home found employment scarce and wages low. Approximately half of all youth and more than half of farm youth had only eighth grade schooling or less. A majority of those who had discontinued their schooling reported that financial difficulties were the cause. School and church organizations were those most frequently attended by youth, but lesser precentages attended meetings of other organizations operative in the State.

**What problems face the rural youth of North Dakota?** J. P. Greenlaw (*North Dakota Sta. Bimo. Bul., 2 (1940), No. 6, pp. 7-12, figs. 3).*—A digest of Bulletin 293, noted above.

**Rural community organization,** D. Sanderson and R. A. Polson (*New York: John Wiley & Sons; London: Chapman & Hall, 1939, pp. IX+448, figs. 13).*—This is a textbook for mature students.

**The church in rural life,** D. E. Lindstrom (*Champaign, Ill.: Garrard Press, 1939, pp. XIV+145).*—This book is intended to present the way to new and enlarged opportunities for service among rural churches.

**How should the permanent school fund be managed?** O. A. Holm (*South Dakota Sta. Cir. 29 (1940), pp. 19, figs. 2).*—The origin, growth, investment, etc., of the permanent school fund of the State are described. House Joint Resolution No. 10 of the 1939 State legislature proposing a constitutional amendment permitting changes in the handling of the fund, is analyzed, with suggestions and recommendations.

**The nature of news,** C. F. Reuss (*Wash. State Col. Res. Studies, 8 (1940), No. 1, pp. 26-32).*—The author concludes that "news is a medium of communication across space, making man aware of events in his transperceptual environment and bringing one person or group into contact with another at some remote point—in another part of the city, continent, or the world."

## FOODS—HUMAN NUTRITION

**[Food and nutrition studies of the Massachusetts Station]** (*Massachusetts Sta. Bul. 369 (1940), pp. 19, 20, 29–31, 41, 42, 71–73, 74, 75*).—Included in this progress report are summaries of studies, several of which represent a continuation of earlier work (E. S. R., 81, p. 591), by J. E. Fuller and W. B. Esselen, Jr., on iodine in the ration with reference to the coli : acidophilus ratio in the stools of white rats, Fuller on indol production by *Escherichia coli*, and Fuller and E. R. Higgins on the relationship of onion juice to bacterial growth (pp. 19, 20); by M. E. Freeman and W. S. Ritchie on chemical changes in the cooking of potatoes and the preservation of spinach by canning and freezing (pp. 29–31); by W. S. Mueller and N. L. Keyock on the nutritive value of chocolate milk, Mueller and L. D. Lipman on the effect of cocoa upon the digestibility of milk proteins, and Mueller on the nutritive value of milk flavored with a water extract of cocoa (pp. 41, 42); by H. S. Mitchell, G. M. Cook, O. A. Merriam, and A. W. Wertz, with the assistance of G. J. Hadro and M. D. Henderson, on the cause and control of nutritional cataract (E. S. R., 82, p. 848), Mitchell and Hadro on the comparative effects of kelp, kelp ash, and a synthetic salt mixture on cholesterol-induced atherosclerosis in rabbits, and Mitchell, Merriam, and E. Miller on the adaptometer as an instrument for detecting vitamin A deficiency (pp. 71–73); and by C. R. Fellers and J. A. Clague on canned apple slices in sirup, Fellers, C. F. Dunker, and L. R. Parkinson on vitamin D bio-assays, Fellers, K. G. Shea, and Esselen on cocoa shell meal as a source of vitamin D for rats, Fellers and K. T. Farrell on factors influencing the nutritive value of snap beans, and Fellers and W. H. Hastings on the availability of iron in certain foods as affected by freezing (pp. 74, 75).

**Improper mixing is cause for failure of sponge cakes at higher altitudes,** W. E. Pyke and G. Johnson (*Colo. Farm Bul.* [*Colorado Sta.*], *2* (*1940*), *No. 3, pp. 9–12, figs. 2*).—In explaining to the housewife in the Rocky Mountain West the directions given in Technical Bulletin 27 (E. S. R., 83, p. 268) for preparing and baking whole-egg and egg-yolk sponge cakes at high altitudes, the authors state that the reason difficulty has often been experienced in the use of sponge cake recipes adjusted for altitude is that the leavening air which is whipped into the meringue during the batter mixing has been added almost entirely by chance. The method of controlling the amount of air, as developed by the authors, is described, with the tabulated formulas for whole-egg and yolk sponge cake and correct weights of one cup of batter for proper leavening at different altitudes.

**Formulas and methods for preparation of better fresh cherry juice products,** W. E. Pyke and G. Johnson (*Colo. Farm Bul.* [*Colorado Sta.*], *2* (*1940*), *No. 3, pp. 4, 5*).—Practical directions are given for the home preparation and pasteurization of cherry juice, with three formulas for cherry cocktails. It is noted that cold pressing yields a juice that retains the fresh cherry flavor better than hot pressing, but hot pressing yields a more highly colored juice. Cold pressed juice of the cherries of the English Morello variety is more highly colored than juices from Early Richmond or Montmorency varieties. Although there is little difference in the acidity of apple and sour cherry juice, and apple juice contains only a little more sugar than cherry juice, the latter is from four to six times more astringent. For this reason cherry juice should be diluted and sweetened to bring out its best flavor. The three cocktail formulas illustrate (1) the blending of hot processed juice and cold processed juice of a single variety of Montmorency, (2) the blending of cold and hot pressed English

Morello and cold pressed Montmorency, and (3) a straight cold pressed blend, all with appropriate amounts of 18 or 15 percent sugar sirup.

**Effectiveness of heat penetration in the canning of meat in the home by the pressure cooker both in tins and glass jars,** C. I. Nelson (*North Dakota Sta. Bimo. Bul., 2 (1940), No. 6, pp. 5–7*).—In this brief article, prepared particularly for farm housewives in the State, studies covering the work with tin cans (E. S. R., 82, p. 556) are summarized, with recommendations for safe practices in home canning by the pressure cooker method of meat, both in tin cans and in glass jars.

**The physiological and economic bases of nutrition, I–III,** J. B. Orr (*Jour. Roy. Inst. Pub. Health and Hyg., 2 (1939), No. 12, pp. 661–676; 3 (1940), Nos. 1, pp. 9–24; 2, pp. 37–51*).—The three Harben lectures for 1939, delivered at the Royal Institute of Public Health and Hygiene, Great Britain, were given under the following topics:

I. *Dietary standards.*—In this lecture the author discussed methods of determining the requirements for calories, protein, fat, minerals, and vitamins and factors affecting these requirements, and presented as dietary standards those of the British Medical Association, Stiebeling, and the League of Nations. Attention was called to the rather close agreement among these standards, although the first is at minimum cost, the second at moderate cost, and the third an optimum standard with no reference to cost.

II. *The assessment of the state of nutrition.*—Methods which have been used in assessing the state of nutrition were discussed under the groupings somatometric body measurements, clinical examination, and physiological tests, with the conclusion that the subject is still in the experimental stage and that what is needed most at present is a closer linking up of laboratory research and clinical observation. "The laboratory research worker is apt to overemphasize the importance of the tests he is using and may fall into grievous error unless results are controlled by expert clinical examination, which takes account of the state of health of the individual as a whole. On the other hand, clinicians trained too exclusively to deal with pathological conditions which are so gross that the layman has recognized the need for calling in the doctor are apt to pay too little attention to the all important effects of the earlier deviations from health caused by minor degrees of dietary deficiencies." It was pointed out, however, that the final and conclusive test is the resulting improvement in health and physical fitness in the individual child following improvement of faulty diet.

III. *The economic basis of nutrition.*—The economic problems raised by the newer knowledge of nutrition were discussed, with particular emphasis on food in wartime. A national food policy for the war was proposed, the general principle of which is to increase home-production of milk, potatoes, and vegetables, and in the case of imported foods to give priority first to wheat and fats and next to valuable foods which occupy small shipping space per unit value, such as dried milk and cheese. Literature references are appended.

**Food values at a glance and how to plan a healthy diet,** V. G. Plimmer (*London and New York: Longmans, Green and Co., [1939, 2. ed.], pp. 190, pls. 27, figs. 9*).—The present revision of this book does not differ appreciably from the earlier edition (E. S. R., 75, p. 420) in the general plan of presentation. The text has been revised and brought up to date with regard to the essential facts about food requirements and food values, and a number of charts and numerical tables have been added to show at a glance the vitamin content of many of the common foods. The values given are averages derived from a number of sources that are cited. The book has been written looking toward the

demand for practical information on foods that would be necessitated by war conditions.

**The synthesis of fat from protein by the albino rat,** R. HOAGLAND and G. G. SNIDER. (U. S. D. A.). (*Jour. Nutr., 18 (1939), No. 5, pp. 435–440*).—A pair of rats was selected from each of seven litters at the age of 20–25 days. One rat from each pair was sacrificed for determinations of the content of total fatty acids. The other was maintained for 60 days on a diet consisting chiefly of casein and then killed for similar analysis. The difference between the values at the beginning (estimated from litter mate analyses) and end ranged from 1.17 to 10.12 gm., with an average of 6.85 gm. The percentage gains ranged from 38 to 358, with an average of 257 percent.

**Choline metabolism.—I, The occurrence and prevention of hemorrhagic degeneration in young rats on a low choline diet,** W. H. GRIFFITH and N. J. WADE (*Jour. Biol. Chem., 131 (1939), No. 2, pp. 567–577, fig. 1*).—This report deals with the production of fatty livers in young rats on a choline-deficient diet, as noted in a preliminary report (E. S. R., 81, p. 869), and the production of a hitherto unrecognized effect of choline deficiency "characterized by an extreme toxic state in which there is a marked hemorrhagic enlargement and degeneration of the kidneys, a regression of the thymus, and an enlargement of the spleen." This pathological condition was prevented in a group of young rats by the addition of 0.4 mg. of choline chloride per gram of food, but the livers of the protected animals had 8.8 times the normal fat content, and 2 mg. of choline chloride per gram of food was required to prevent this lipotropic action. A greater requirement for choline by young than by older rats was shown by the fact that while 40-gm. rats developed fatty livers on diets only moderately low in choline, rats weighing 124 gm. failed to develop fatty livers on the same diet.

**The mineral and nitrogen metabolism of college women** (*Nebraska Sta. Rpt. [1939], pp. 52, 53*).—Progress is reported on studies of the calcium, phosphorus, iron, copper, and nitrogen metabolism (E. S. R., 81, p. 739).

**Mineral metabolism,** A. T. SHOHL (*New York: Reinhold Pub. Corp., 1939, pp. X+384, figs. 13*).—This monograph presents a connected account of the role of minerals in the structure and function of the human body. An extensive bibliography is presented, although the review makes no pretense at being exhaustive. The following topics are given consideration: Mineral composition of the body: secretions and excretions; internal secretions; total base, chloride, ammonium, and bicarbonate; calcium and magnesium; phosphorus; sulphur; iron; iodine; trace elements; water metabolism; anion-cation relationships; and mineral intakes, balances, and requirements. The chapters on iron and iodine are credited to F. C. Bing, and an author and subject index are included.

**On the approximation of the calculated to determined calcium content of human dietaries,** A. B. GUTMAN and M. LOW (*Jour. Nutr., 18 (1939), No. 3, pp. 257–263*).—The calcium contents of 16 low-calcium and 12 intermediate- and high-calcium diets, as determined by chemical analysis, were compared with the calculated values based on Sherman's figures for the raw foodstuffs. Variations in determined values reflect variations in the calcium content of raw foodstuffs plus errors due to sampling, cooking losses, and chemical analysis. The range of variation attributable to these causes is shown in the tabulated results of analyses of diets in consecutive 5-day periods. In these diets the variations were minimized as far as possible by careful weighing and sampling of the raw material, which was purchased in quantities sufficient for the entire diet period, by preparation of the cooked foods in the diet kitchen under con-

ditions designed to minimize leaching out of minerals and to promote conservation of the cooking juices, and by careful sampling and analysis of the cooked foods.

Calculated estimates exceeded the determined values in 14 out of 16 observations on the low-calcium diets and in 8 out of 12 observations on the high- and intermediate-calcium diets; in the former group the percentage deviations of the calculated values (based on Sherman's 1937 figures) ranged from +16 to −49 percent as compared with +13 to −24 percent in the latter group. For the majority of the diets, estimates based on Sherman's 1937 tables were in closer agreement with the determined values than estimates made from the 1926 tables.

It is emphasized that calculated estimates of the calcium content of diets should not be used when conducting calcium balances for clinical or metabolic studies.

**Adaptation to a low calcium intake in reference to the calcium requirements of a tropical population,** L. Nicholls and A. Nimalasuriya) *Jour. Nutr., 18 (1939), No. 6, pp. 563–577, fig. 1).*—The standard allowances for the daily intake of calcium for children and adults, as given by authorities in America (H. C. Sherman) and in Europe (I. Leitch), are considered too high for the Ceylonese population. Children at 5 yr. receive as a rule as little as 0.2–0.4 gm. of calcium daily and many adults never receive more than 0.3–0.6 gm. per day. Most of the children grow to adults, however, and the population shows a racial metabolic adaptation to these low levels.

As evidence of this metabolic adaptation, data are presented showing an average of 0.0041 gm. per 100 cc. in urines of 62 boys of the laboring classes as compared with 0.0096 gm. in urines of a similar number of upper class boys receiving about 1 gm. of calcium daily. Results of calcium balance studies are also presented showing retentions in children varying from 34 to 89 percent on daily intakes of approximately 0.2 gm.

Tables are presented showing, for Ceylonese males and females in each of two social classes, the yearly increase in the calcium content of the body from the fifth through the seventeenth year of age. The body content of calcium was estimated from data obtained at autopsy on skeletal weights (dry basis) of 35 individuals. Skeletal calcium, considered an approximate measure of total body calcium, was estimated in children as 25 percent of the dry skeletal weight; in adults (12–17 yr.), it was calculated from the average of analyses of 10 femurs.

Daily retentions for the lower class males ranged from 0.06 gm. between the ages of 5 and 6 yr. to 0.254 gm. between the ages of 15 and 16 yr. In the upper class males this retention ranged from 0.079 gm. between the ages of 6 and 7 yr. to 0.416 gm. between the ages of 13 and 14 yr. The retention rates of the females were somewhat lower.

Adult calcium requirements, considered to give generous allowances, were calculated by the formula—grams of calcium retained × 2 + 10 mg. per kilogram body weight; the weights used in these calculations were taken from standard age-weight tables for Ceylonese children and adolescents of the various social classes.[8] Standard allowances convenient for practical use are also recommended on the basis of these calculated values for the children of the upper social status (children of the poorer classes compared unfavorably in height and weight with those of the upper classes). These recommendations are for 0.5 gm., 0.75, and 1.00 gm. of calcium, respectively, for children from 1 to 7 and from 7 to 12 yr. and for adolescents from 12 to 20 yr. A standard

[8] Ceylon Jour. Sci., Sect. D, Med. Sci., 4 (1936), No. 1, pp. 70, pl. 1, figs. 14.

allowance of 0.5 gm. of calcium daily is considered sufficient for Ceylonese adults excluding lactating women.

**The calcium content of white bread,** W. W. PROUTY and W. H. CATHCART (*Jour. Nutr., 18 (1939), No. 3, pp. 217–226*).—Moisture, ash, and calcium are reported for control loaves of bread made on a small commercial scale, with 0.25 percent (on the basis of flour 100 percent) of Arkady yeast food in each dough and with various percentages of dry skim or dry whole milk. With no milk, the loaf on a 38 percent moisture basis averaged 1.75 percent ash and 0.025 percent Ca; with 2, 4, 6, 8, and 10 percent of dry skim milk the loaves on this same moisture basis averaged 2.07, 2.07, 2.14, 2.29, and 2.31 percent of ash and 0.039, 0.052, 0.063, 0.081, and 0.097 percent of Ca, respectively; with the same proportions of dry whole milk corresponding values of 2.20, 2.10, 2.64, 2.21, and 2.46 percent were obtained for ash and 0.041, 0.042, 0.047, 0.060, and 0.074 percent for Ca.

Moisture, ash, and Ca are also reported for 39 commercial loaves of white bread obtained from 33 bakeries. These loaves were made with different types of milk variously used in amounts ranging from 2 to 15 percent on the basis of flour 100 percent. The values obtained for Ca ranged from 0.048 to 0.145 percent, averaging 0.080 percent (calculated on a 38 percent moisture basis); ash values averaged 1.86 percent on this same basis. It is pointed out that white breads made with milk solids and with the use of yeast foods, which may contain relatively large quantities of calcium salts, are richer in Ca than some of the older figures on this constituent in bread would indicate.

**The effect of apples and cranberries on calcium retention,** A. MINDELL, W. B. ESSELEN, JR., and C. R. FELLERS. (Mass. Expt. Sta.). (*Amer. Jour. Digest. Diseases, 6 (1939), No. 2, pp. 116–119*).—Calcium retention, estimated as the difference between calcium intake and calcium excretion (fecal), was determined (after preliminary adjustment to the dietary regime) for 3-day experimental periods in individual rats receiving either the control basal diet or this diet supplemented with 20 percent of cranberries or apples. The basal diet, with the calcium chiefly in the form of the carbonate, furnished 11.40 mg. of calcium per gram of food; the apples and cranberries contained, respectively, 0.209 and 0.587 mg. of calcium per gram (moist basis). The findings indicated that the animals receiving the apple supplements retained 50.5 percent of the ingested calcium, while the corresponding control group retained on an average 39.6 percent. Corresponding averages for the test animals receiving cranberries and the control group were 49.8 and 41.5 percent.

In the femur ash little difference was noted between controls and test animals when apples constituted the supplement. When cranberries were added to the basal diet the femur ash of the 10 test animals averaged $1.8\pm0.4$ percent higher than that of the 10 controls.

**Normal hematologic standards in the aged,** I. MILLER (*Jour. Lab. and Clin. Med., 24 (1939), No. 11, pp. 1172–1176*).—The results of a hematologic study of 160 men over 60 yr. of age are presented. Average results by 5-yr. groups in the 160 men are reported, as well as averages for the entire group. The latter are compared with standards in males 14–30 yr. of age. This comparison indicated that the red blood cells per cubic millimeter of blood are diminished in old age, the average red blood cell count being 4,460,000 as compared with an average of 5,400,000 in the younger subjects. It is considered that chronic low grade infection, nephrosclerosis, and decreased cellularity of the red bone marrow in old age may be causative factors. No increase in red blood cells was found associated with hypertension. The hemoglobin per 100 cc. of blood (determined with the Hellige wedge hemometer) averaged 14.3 gm. in the

aged group as compared with an average of 15.8 gm. in the younger group. The decrease in hemoglobin is proportional to the decrease in red blood cells.

**The rat growth factors of the filtrate fraction of liver extracts,** G. H. Hitchings and Y. Subbarow (*Jour. Nutr., 18 (1939), No. 3, pp. 265–276, fig. 1*).—A 95 percent alcohol extract of liver, which served as the starting material, was treated with fuller's earth, adsorbate and filtrate fractions thus being obtained. The filtrate fraction was subjected to further study in an attempt to concentrate the rat growth factor. Various preparations were tested for their activity by feeding them as supplements to young rats on a basal diet essentially free of B vitamins but supplemented with adequate amounts of pure thiamin and riboflavin and by the fuller's earth adsorbate fraction from the liver extract. This adsorbate fraction was included as a supplement to the basal diet, since preliminary studies had shown that the filtrate fraction did not give the full activity of the liver extract except as fed with the adsorbate fraction, which also was relatively inactive when fed separately.

The growth-promoting substances of the fuller's earth filtrate could be concentrated by a series of steps involving extraction with amyl alcohol, followed by extraction of the alcoholic solution with aqueous NaOH, adsorption on charcoal from this aqueous solution, elution from the charcoal with 60 percent equeous ethanol, evaporation to remove the alcohol, taking up the residue in water, acidifying, and finally submitting the acid aqueous solution to continuous ether extraction. Part of the activity, however, appeared to remain in the aqueous phase, this portion being more stable to acid hydrolysis than the portion in the ether phase. The activity of the ether extract could be concentrated further by fractionation of the brucine and calcium salts; some evidence was obtained to indicate that the active substance in this final preparation might be pantothenic acid.

**Fruits and vegetables contain many vitamins,** D. K. Tressler (*Farm Res. [New York State Sta.], 6 (1940), No. 3, p. 8*).—Recent studies by the station on the vitamin content of New York State fruits and vegetables are noted briefly, and a table based upon these studies is given of a number of vegetables and fruits classified as excellent, very good, good, and fair sources of vitamin C.

**The effects of vitamin deficiency on the gastro-intestinal tract,** D. L. Wilbur (*Amer. Jour. Digest. Diseases, 6 (1939), No. 9, pp. 610–617*).—The material included in this review has been grouped in sections dealing with the effects of deficiency of vitamins A, the B complex, C, D, E, K, and the antigizzard erosion factor, with the first three sections subdivided into pathologic changes in animals and man, physiologic changes in animals and man, and symptomatic changes. A list of 64 literature references is appended.

**Biophotometer test as index of nutritional status for vitamin A,** G. Steininger and L. J. Roberts (*Arch. Int. Med., 64 (1939), No. 6, pp. 1170–1186, figs. 4*).—For the purpose of determining the reliability of the biophotometer test and its validity as a measure of vitamin A stores, over 2,000 tests, following the technic of Jeans et al (E. S. R., 77, p. 886), were made on 194 adults and 265 children. Data used in determining the reliability of the test were obtained from 6 adults given from 16 to 20 tests each, 50 children given 6 tests each, and 283 subjects (48 adults and 235 children) given 2 to 3 tests each. From these tests the authors conclude that "single tests of a subject are unreliable, as the readings may vary so widely on successive tests, even with a constant dietary regimen, as to change his classification to or from the normal or the subnormal zone. The general trend, however, of the readings for the same subject is fairly constant, and the test, therefore, can be used to determine the level for a person or for a group if a sufficient number of readings are

obtained to determine their variability. This procedure is time consuming and practically rules out the test, even if it were valid, for routine clinical use."

Evidence concerning the validity of the test as a measure of vitamin A stores was obtained along 3 lines. (1) A group of 100 children of high socioeconomic class was compared with 160 from a very low socioeconomic group in mean biophotometer readings and in the percentage of children in each group classed from the readings as normal, borderline, and subnormal. The biophotometer readings were significantly higher for the children in the high than in the low socioeconomic group, but even in the superior group only 26 percent of the children could be classed as normal according to the Jeans standard. (2) A daily supplement of 10,000 units of vitamin A in the form of carotene for 6 weeks and 20,000 for a subsequent 2 weeks given to 50 children with low original readings caused no significant difference in the mean values of the group as a whole as compared with those of a matched group of controls, but in 14 of 16 pairs in which a real difference was evident the odds were in favor of the child who received the supplement. (3) Six women subsisted on a constant weighed diet with a calculated vitamin A content of less than 100 units per day for 25, 30, and 44 days in the case of 3 and 123 days for the other 3 subjects who each received a supplement of 1,000 units of vitamin A on the sixty-fifth, seventy-second, and seventy-sixth day. A significant change in the biophotometer readings occurred in only 2 of the 6 subjects, and these were not among the 3 subsisting on the diet for 4 mo. The response of the various subjects was not consistent with either their original biophotometer readings or their dietary histories.

"These results make it evident that, although some relation exists between the biophotometer readings and vitamin A nutrition, the relation is not close enough to warrant the use of the test as a means of diagnosing subclinical vitamin A deficiency. The basic idea, however, of the use of measurements of dark adaptation for determining deficiencies of vitamin A seems promising and worthy of further experimentation."

**Vitamin A requirements in infancy as determined by dark adaptation,** J. M. Lewis and C. Haig (*Jour. Ped., 15 (1939), No. 6, pp. 812–823, figs. 3*).—Using the procedure noted previously (E. S. R., 83, p. 564), the authors have determined the minimum light thresholds after complete dark adaptation in 53 normal institution infants from 1½ to 13 mo. of age. One group of 26 received the average diet recommended in private practice for infants but without vitamin A supplements. A second group of 9 had been for 4 mo. on a similar diet, but fortified with 15 drops daily of halibut-liver oil furnishing approximately 17,000 units. A third group of 4 was placed at 2 or 3 mo. of age on a special diet containing approximately one-fourth as much vitamin A as the ordinary diet, and a fourth group of 14 on a diet even more restricted in vitamin A, furnishing about one-twelfth that of the ordinary diet. Both of these groups were tested at intervals for periods varying from 8 to 10 mo.

The results of the dark adaptation tests were within the arbitrarily assigned normal limits in all four groups, and the infants on the diets furnishing only 135–200 vitamin A units daily showed as good weight gains and freedom from susceptibility to infection as those receiving 17,000 units daily. Three infants who, because of eczema, received in place of milk a proprietary preparation containing soybean, starch, and olive oil and almost devoid of vitamin A showed poor dark adaptation in from 3 to 4 weeks. The addition of 120 units daily of vitamin A in the form of cod-liver oil brought the values back to normal in 2 of these infants. This dosage amounted to from 18 to 20 units per kilogram of body weight, respectively. A single dose of 30,000–50,000

units of vitamin A administered to 2 other infants who had shown poor dark adaptation on the soybean diet resulted in return to normal dark adaptation values in 40 and 65 min., respectively. The authors conclude that, since the average diet of infants contains approximately 12 times as many units of vitamin A as were contained in the low vitamin A diet tested, it would seem unnecessary to supplement the average diet of infants with special vitamin A preparations.

**Effect of anoxemia on the dark adaptation of the normal and of the vitamin A-deficient subject,** R. McDonald and F. H. Adler (*Arch. Ophthalmol., 22 (1939), No. 6, pp. 980–988, figs. 5*).—This study was conducted with the Hecht apparatus on a healthy adult male who had been a subject for dark adaptation experiments for several months. After the normal dark adaptation curve for rods and cones had been obtained, the amount of oxygen in the circulating blood was reduced by breathing a mixture of air and nitrogen containing only about half as much oxygen as normal air and the readings were repeated. During the period of anoxemia there was a temporary but significant upward displacement of the thresholds for both rods and cones by a factor of 2.5 (log I=0.4). The subject was then placed on a vitamin A-deficient diet calculated to supply from 250 to 350 Sherman units per day. A rise in the threshold values was first noted on the fourth day and continued until about the fifth week, after which the levels remained practically constant until the end of the experiment in the ninth week. Curves plotted at the fourth and sixth weeks showed an unequal rise in the two plateaus, the rods showing the greater rise. A second anoxemia test resulted in a similar rise in threshold values for rods and cones. The unlike changes produced by anoxemia and vitamin A deficiency are considered to suggest that two different processes in the visual response are involved.

**Riboflavin deficiency in man,** N. Jolliffe, H. D. Fein, and L. A. Rosenblum (*New England Jour. Med., 221 (1939), No. 24, pp. 921–926, figs. 4*).—Lesions similar to, though more advanced than, those produced experimentally by Sebrell and Butler through riboflavin deficiency (E. S. R. 83, p. 134) are described for 15 patients, with detailed case reports and accompanying photographs for 4. "These lesions consist of filiform, seborrheic excrescences distributed most often in the nasolabial folds but frequently involving the alae nasi and less often the bridge of the nose and the forehead, superimposed on a skin which has a fine, scaly, greasy desquamation in the same locations, and cheilosis, characterized by maceration and fissures at the angles of the mouth and degeneration of the epithelium of the lips, especially the lower. These lesions, like those produced experimentally, improve following the administration of natural or synthetic riboflavin, but fail to respond to diets poor in the vitamin B complex or to nicotinic acid. We, therefore, feel justified in attributing them to riboflavin deficiency."

It is considered of interest that 9 (60 percent) of the 15 patients with riboflavin deficiency were women, whereas only 26 percent of the pellagrins routinely admitted to the service (Bellevue Hospital, New York City) are women. Attention is also called to the fact that the cases of riboflavin deficiency reported by Sebrell and his associates were from the South where pellagra is endemic, while the cases here reported were from New York City. The average of 1 case a month among a total of 272 admissions at Bellevue Hospital indicates that the disease may not be uncommon in the Northeastern States.

**The synthesis of vitamin $B_1$ from the pyrimidine and thiazole portions by animal tissues** [trans. title], E. and R. Abderhalden (*Pflüger's Arch. Physiol., 243 (1939), No. 1, pp. 85–93*).—The synthesis of aneurin from 2-methyl-4-amino-5-

bromomethyl-pyrimidinehydrobromide and 4-methyl-5-hydroxy-ethyl-thiazole was accomplished in the presence of blood plasma or serum or extracts of organs (liver, muscle, heart, brain, and kidneys of rabbits, liver, muscle, and heart of pigeons, and liver and muscle of the rat). The reaction was carried out in physiological saline at 37° C. and a pH optimum between 6 and 7. The extracts were prepared by treating freshly excised and finely comminuted tissue with 0.9 percent NaCl (2–3 cc. per gram of tissue), grinding the mixture with sand, and centrifuging for 10–15 min.

Pigeons which had been kept on a vitamin $B_1$-free ration for 1 mo. were restored to health by parenteral administration of 12 mg. of 2-methyl-4-amino-5-bromomethyl-pyrimidinehydrobromide and 6 mg. of 4-methyl-5-hydroxy-ethyl-thiazole on each of two successive days. There was a decrease in body weight and a fall in temperature upon this treatment, but such behavior was also observed in vitamin $B_1$-deficient pigeons similarly injected with 10γ of aneurin. Vitamin $B_1$ avitaminosis in pigeons was not cured, however, by the injection of relatively large doses of 4-amino-5-chloromethyl-6-methylpyrimidine or 4-amino-5-bromomethyl-pyrimidinehydrobromide or 2-ethyl-4-amino-5-bromomethyl-pyrimidinehydrobromide+4-methyl-5-hydroxy-ethyl-thiazole; nor were the organ extracts or blood serum or plasma able to synthesize the vitamin in vitro in the presence of these compounds.

**Methods for assessing the level of nutrition: A carbohydrate tolerance test for vitamin $B_1$.—I, Experiments with rats,** G. G. Banerji and L. J. Harris (*Biochem. Jour., 33 (1939), No. 8, pp. 1346–1355, figs. 8*).—The possibility of assessing degrees of vitamin $B_1$ deficiency by the measurement of latent defects in carbohydrate metabolism was investigated in exploratory work on rats. In the first of three series of tests the excretion of bisulfite-binding substances (B. B. S.) was determined over long periods of time in rats receiving adequate amounts of vitamin $B_1$ as compared with others receiving no vitamin or only suboptimal amounts. It was found that the excretion of B. B. S. increased slightly with the degree of deficiency of the vitamin. A related intermediate metabolite, sodium lactate, given to the animals in tests similar in other respects to those of the first series, caused an increase in the excretion of B. B. S., thus making minor deficiencies more apparent. In the third series the administration of a single dose of vitamin $B_1$ caused a temporary check in the excretion of B. B. S., its magnitude as determined by the time elapsing before the B. B. S. returned to normal being found to be proportional to the dose given.

The method is thought to be applicable in rat tests for the assay of vitamin $B_1$ in foods and in tests with human subjects to assess the nutritional status of the subject with respect to vitamin $B_1$ as an alternative to measurements of $B_1$ in the urine. "Preliminary tests on human subjects indicate that an increase in B. B. S. can be produced experimentally by a diet low in vitamin $B_1$, and that high values frequently accompany subnormal excretion of vitamin $B_1$ (e. g., during pregnancy). Further work is needed, however, to define quantitatively the most accurate conditions for applying the carbohydrate tolerance test to human beings so as to control other variables, e. g., basal diet, exercise. The results have always to be checked by giving vitamin $B_1$ to prove whether the abnormal carbohydrate tolerance is the result of a specific vitamin $B_1$ deficiency."

**Methods for assessing the level of nutrition of the human subject: Estimation of vitamin $B_1$ in urine by the thiochrome test,** Y. L. Wang and L. J. Harris (*Biochem. Jour., 33 (1939), No. 8, pp. 1356–1369, figs. 4*).—Detailed examination of the thiochrome method for the determination of vitamin $B_1$ in the urine is reported, with working details for a modified technic and data

obtained by the modified method in the examination of the urines of 11 normal subjects and a number of patients and in a comparison of the method with the bradycardia method as applied by Harris and Leong (E. S. R, 76, p. 425).

The most important sources of error in the thiochrome method as ordinarily used were found to be incomplete removal of the vitamin in the adsorption; interference from nonspecific fluorescing substances, other reducing substances, and pigments in the urine; and fluorescence caused by the use of impure reagents. The principal features of the technic as developed to overcome these difficulties include omission of the preliminary adsorption to avoid loss of the vitamin and overconcentration of interfering substances, preliminary washing with isobutanol to remove preformed thiochrome or other pigments, regulation of the amount of $K_3Fe(CN)_6$ used, treatment of the filter paper and reagents to remove fluorescing substances, further removal of interfering substances by washing the final isobutanol solution of thiochrome with water, and direct comparison of the blue fluorescence.

The usual range in vitamin $B_1$ excreted by normal subjects not receiving special sources of vitamin $B_1$ was from about 50 to 80 International Units daily, with minimum and maximum values of 33 and 160 I. U. (the latter from a subject receiving marmite). Attention is called to the fact that the minimum values are considerably higher than the earlier estimates by the bradycardia method. Low values were obtained in pregnancy and in conditioned deficiencies attributed to anorexia or faulty nutrition. Responses to test doses were consistent with the state of nutrition of the subject, two normal subjects showing a marked increase after the first dose and a subject known to be deficient showing but little increase until the second dose. A satisfactory parallelism was found between the results of chemical and biological tests. Percentage recoveries of added vitamin $B_1$ ranged from 94 to 108 percent.

**The thiochrome test for aneurin (vitamin $B_1$) in urine as an index of nutritional level**, G. M. Hills (*Biochem. Jour.*, *33* (*1939*), *No. 12*, *pp. 1966–1979*, *figs. 3*).—A simplified procedure for the determination of aneurin (thiamin) in urine by the thiochrome test in which photoelectric measurement of fluorescence is employed and rendered more specific for thiochrome is described in considerable detail, and data are reported on the application of the method to the determination of thiamin excretion in normal subjects and in hospitalized neurological patients. Values are given for 24-hr. excretions and for 3-hr. excretions following a test dose of 1 mg. of thiamin given with a breakfast low in thiamin.

In the discussion of the method particular consideration is given to the collection of the specimens, the question of the advisability of using the adsorption technic recommended by some and not by others, sources of error in the blank test, calibration, the use of one concentration of oxidizing agent, and the use of wet isobutanol as solvent. Concerning adsorption, the author considers that the direct oxidation technic, as recommended by Wang and Harris in the paper noted above, is best adapted for use in concentrated urines of high thiamin content, but for greater accuracy with urines of low thiamin content adsorption as adopted in the present study is preferable. On the same samples, thiamin values by the adsorption method were on an average 30 percent lower than by the Wang and Harris method. Six normal subjects, five male and one female, excreted from 50 to 170, with a mean of 100 μg., of thiamin in 24 hr.; and from 26 to 110, with a mean of 65 μg., in 3 hr. following a 1-mg. test dose. The results for the 24-hr. excretion were roughly parallel to those obtained after the test dose, but with sufficient variation to warrant recommendation of the 3-hr. excretion after the test dose, without correction for the excretion during the previous control period, as the best index of nutritional

level, with the further precaution of having the test period preceded by a few hours of low thiamin intake to avoid errors due to retention of the concentrated urine of the previous night. Of the nine neurological cases, five gave a lower 24-hr. excretion and six a lower excretion after the test dose than the lowest normal case. In an attempt to saturate some of the hospital subjects by continued treatment of thiamin in quantities of 1-3 mg. daily by mouth or 10 mg. by intravenous injection, the thiamin excretion increased considerably in all patients except a case of thyrotoxicosis. Saturation appeared to be reached at a level of about 500 μg. per day, with an excretion of 200 μg. in 3 hr. after the 1-mg. test dose.

**A quantitative chemical study of the urinary excretion of thiamine by normal individuals,** D. Melnick, H. Field, Jr., and W. D. Robinson (*Jour. Nutr., 18 (1939), No. 6, pp. 593–610, figs. 7*).—Analyses of six consecutive 4-hr. urine collections from three normal male subjects on adequate diets of calculated thiamin intake showed lower values in the morning than in the afternoon and evening specimens, indicating an appreciable lag in the excretion of ingested thiamin. The response in increased thiamin excretion of the same subjects to 5-mg. test doses administered in different ways was the most prompt and extensive following intravenous injection, with the greater part of the total amount excreted (representing over 30 percent of the intake) occurring in the first 4 hr. The response was somewhat slower and less complete following subcutaneous and intramuscular injections, and even more gradual and less complete following oral administration. However, the authors recommend oral rather than parenteral administration of single test doses because the flooding effect of the latter tends to mask the differences in excretion of normal and vitamin $B_1$-deficient subjects. The thiamin excretion of three subjects on the same oral dose of thiamin was much less when the thiamin was taken fasting 12 hr. after the preceding meal than when taken with a meal. "Apparently a considerable part of the vitamin taken into the fasting stomach is destroyed prior to absorption."

The 24-hr. thiamin excretion of a group of 15 men and 10 women from 25 to 30 yr. of age on their customary diets ranged from 90 to 350, with an average of 198 μg., for the men, and from 61 to 146, with an average of 93 μg., for the women. The thiamin content of the diets, calculated from the tables of Williams and Spies (E. S. R., 80, p. 710), averaged 960 μg. for the men and 710 μg. for the women, and the thiamin nonfat-calorie ratios 0.8 and 0.9, respectively. Recoveries following test doses of 5 mg. of thiamin taken immediately after the largest meal of the day ranged from 8 to 19 percent for both men and women, with averages of 14 and 12 percent, respectively. During a period of 8 mo. two male subjects gave thiamin excretion values ranging from 120 to 200 μg. and 120 to 260 μg., respectively. The variations on different diets approached uniformity for the same subject on a constant diet. During the production of thiamin deficiency in a single subject on a diet furnishing only 260 μg. daily of thiamin, the thiamin excretion dropped rapidly to very low levels, which were maintained with slight fluctuations during the 22 days in which no supplement was fed and showed a very slow response to increased intake of thiamin. Evidence is also presented, showing that the response to an oral test dose of thiamin is governed by the nutritional status of the individual rather than by the adequacy in thiamin of the diet consumed at the time of the test, and that subsequent to flooding the organism with thiamin (as is the case with thiamin therapy) a period of 2 weeks may elapse before the urinary values return to the normal basal levels.

**Vitamin C studies in the rat: The effect of copper and various organic substances,** J. L. Svirbely (*Jour. Biol. Chem., 131 (1939), No. 1, pp. 233–241*).—

This paper represents a continuation of earlier studies (E. S. R., 78, p. 136) of the effect on the vitamin C content of rat organs and tissues of the administration of substances which interfere with the normal metabolic activities of the organs.

Appreciable quantities of vitamin C were found in the organs of rats maintained on diets of varying composition and fed copper as copper sulfate or various organic compounds, including indophenol blue, methylene blue, and bromobenzene. Injections of organic substances such as pyridine, menthol, borneol, thymol, camphor, or phenylacetic acid to fasting rats or the feeding of amidopyrine and antipyrine to rats on the stock diet did not decrease, but in some instances increased, the reducing capacity (vitamin C content) of the liver and gut. A decrease in reducing power of both organs followed the injection of toluenediamine, and a greater increase in reducing power of the gut than the liver followed phlorhizin injection. Marked decreases in the reducing power of the adrenals followed the feeding of acetanilide, acetophenetidin, and to a smaller extent amidopyrine and injections of camphor, borneol, toluenediamine, and hydrazine.

In the tabulated data corrections are made in the vitamin C values as expressed by reducing power for variations in the weights of the liver and gut resulting from the administration of the foreign substances. These corrections are based on observations on the control animals and the relative weights of the organs per 100 gm. of final body weight.

**The relationship of acidity to the vitamin C content of tomatoes,** M. Yarbrough and G. H. Satterfield. (Univ. N. C.). (*Ztschr. Vitaminforsch., 9 (1939), No. 3, pp. 209–212; Ger., Fr., abs., p. 212*).—Simultaneous determinations of the ascorbic acid content and acidity (by titration with N/10 KOH) of 12 or 13 samples each of 3 varieties of tomatoes grown on experimental farms in North Carolina showed no relationship between acidity and vitamin C content or between the size of tomatoes of uniform ripeness and their vitamin C content. The range in ascorbic acid values for the 3 varieties was 0.165–0.290 mg. per gram for Louisiana Pink, 0.148–0.258 for Pritchard, and 0.179–0.309 mg. per gram for Marglobe. The acidity values, expressed as cubic centimeters N/10 KOH per gram of tomato for the individual samples giving the above values, were 1.009 and 0.879, 0.991 and 1.298, and 1.272 and 1.055.

**The effect of vitamin C on lead poisoning,** H. N. Holmes, K. Campbell, and E. J. Amberg (*Jour. Lab. and Clin. Med., 24 (1939), No. 11, pp. 1119–1127, figs. 3*).—From a large number of workmen in an industrial plant where the lead hazard was great, 34 patients were selected with chronic lead poisoning as judged by the basophilic aggregation, abnormal stippling of the red blood cells, and clinical symptoms which were observed to be similar to those in subclinical scurvy. Accordingly, ascorbic acid therapy was instituted, the dosages amounting to 100 mg. per man per day. Half of the men received ascorbic acid alone, at least 2 mo. after discontinuing calcium salt injections which had previously been given as routine therapy, while the other half continued the calcium therapy and at the same time received ascorbic acid. In the former group there was a marked gain in vigor, cheerfulness, color of skin, and blood picture, the improvement beginning in less than a week of therapy. In the 17 patients given ascorbic acid with calcium, the gain was less marked and rather irregular. The improvement due to ascorbic acid treatment in these industrial cases was confirmed by observations on a number of house painters, chronic lead absorption patients, who were given 200 mg. of ascorbic acid daily. In these patients analytical determinations of lead and ascorbic acid in the urine indicated that the ascorbic acid decidedly lowered

the urinary excretion of lead. This fact, together with the observation that men actually suffering with lead absorption excreted less ascorbic acid than the average man, suggested that the toxic lead compounds react with vitamin C to form a poorly ionized salt or a complex salt which yields a very low concentration of simple lead ions.

**The plasma ascorbic acid of infants and children,** C. E. SNELLING (*Jour. Ped., 15 (1939), No. 6, pp. 824–830, figs. 6*).—Plasma ascorbic acid measurements by the technic described by Jackson (E. S. R., 81, p. 744) were made on 158 infants and 77 older children shortly after admission to the hospital and are reported in scatter diagrams plotted against age and in tables.

In 31 breast-fed infants, 8 of whom received orange juice regularly, there was no essential difference in the plasma ascorbic acid between those receiving or not receiving orange juice. The average for the group was 0.76 mg. per 100 cc. In 127 artificially fed infants the average value was 0.23 mg. per 100 cc. In the 79 infants in this group who received 2 oz. or more of orange juice daily, the average value was 0.30 mg. per 100 cc., with about one-third of these having values as low as 0.1 mg. or less per 100 cc. The 48 artificially fed infants receiving no orange juice gave an average value of 0.12 mg. per 100 cc., with two-thirds having values of 0.1 mg. or less. Three in this group had scurvy. Of the entire number of artificially fed infants, 32 showed no evidence and 95 evidence of infection. The average values for these two groups were 0.18 and 0.23 mg. per 100 cc. In 77 children from 2 to 14 yr. of age on admission to the hospital, the average value was 0.75 mg. per 100 cc., with a range of from 0.55 mg. per 100 cc. for 24 with respirator infection to 0.96 mg. per 100 cc. for 8 with diabetes.

The effect of giving ascorbic acid by mouth was tested on 39 infants with low initial values. After one dose of 100, 500, or 1,000 mg., 15 of the 24 infants showed a definite increase in plasma ascorbic acid, and after 2 or 3 days on 500 mg., 8 of 11 showed an increase. Four others, including one mild case of scurvy, required a longer time to bring the plasma ascorbic acid back to normal.

The author concludes that "low plasma ascorbic acid measurements by themselves do not give one the picture of the general ascorbic acid nutrition of the individual and cannot be used as a standard for the diagnosis of scurvy."

**Factors preventing oxidation of ascorbic acid in blood serum,** E. M. MYSTKOWSKI and D. LASOCKA (*Biochem. Jour., 33 (1939), No. 9, pp. 1460–1464*).—Experiments on the action of proteins, amino acids, and salts on the oxidation of ascorbic acid in vitro are described, with the conclusion that proteins have an inhibiting action on the oxidation of ascorbic acid which may be offset to some extent by the presence of copper, the binding of which with protein does not entirely abolish catalytic activity. The amino acids also inhibit the oxidation of ascorbic acid, and are not affected by the presence of copper. Of various salts tested, only chlorides exerted a retarding effect on the oxidation.

**Studies on the possible carrier rôle of ascorbic acid in animal tissues,** M. O. SCHULTZE, C. J. HARRER, and C. G. KING (*Jour. Biol. Chem., 131 (1939), No. 1, pp. 5–12, figs. 2*).—Evidence from the literature in support of the concept that ascorbic acid may function in animal tissues as a reversible oxidation-reduction carrier is noted briefly, as well as earlier work from the authors' laboratory indicating that the evidence thus far does not favor the theory that ascorbic acid functions as a major respiratory carrier in animal tissues. This view is strengthened by the demonstration reported in this paper of the failure of ascorbic acid to function in vitro as a hydrogen transfer agent in a system containing, in addition to ascorbic acid, nicotine, hemochromogen, coenzyme, glucose dehydrogenase, and glucose. The presence of glutathione, either as a

substitute for or in addition to ascorbic acid, did not alter the hydrogen transfer results, although both reagents in the presence of the hemochromogen were oxidized aerobically. Dehydroascorbic acid, either in pure solution or in the presence of dialyzing suspensions of rat liver or muscle, was not reduced by reduced cozymase in vitro at pH 7.2.

**The effect of phosphorus on the biological estimation of vitamin D activity,** B. O'Brien and K. Morgareidge (*Jour. Nutr., 18 (1939), No. 3, pp. 277–284, figs. 2*).—Young rats from a standardized D-assay colony were placed on the 2965 rachitogenic diet of Steenbock and Black. After a 21-day depletion period in which satisfactory rickets developed, as evidenced by radiographic examination, the rats were divided into groups which were given for 8 days supplements of varying amounts of vitamin D dispersed in 4 cc. of a 5 percent gelatin solution. The vitamin D (Drisdol) used was a crystalline vitamin $D_2$ in propylene glycol, and it was dispersed in the gelatin as a protective colloid to simulate the aqueous protein medium of milk. Standardized against the international standard vitamin D solution in corn oil, the vitamin D preparation was found to have a potency of 6.7 International Units per milligram when fed dispersed in gelatin. The experiments were repeated with the modification that a daily supplement of 4 mg. of phosphorus (as sodium glycerophosphate) was added to the gelatin-vitamin D supplement. The response of the rats in this test was such as to indicate an apparent potency of the vitamin preparation of 22.7 I. U. per milligram. This enhancement effect due to the added phosphorus was represented by the factor 3.4. Similar experiments with 2 and 1 mg. of phosphorus, respectively, gave lower enhancement factors, but in all cases in which the phosphorus was supplied by sodium glycerophosphate the factor could be represented by the formula 1.0+0.58 P. Other phosphorus compounds possessed different enhancement factors. Since the total antirachitic activity of the mixture depended not only on the phosphorus level but on the amount of vitamin D present, the observed vitamin D activity, A, was expressed as (1.0+0.58 P) D, where P equaled the number of milligrams of phosphorus (from glycerophosphate) and D the number of units of vitamin D. The significance of this relationship in the determination of the vitamin D potency of phosphorus-containing foods, such as milk, is pointed out.

**Vitamins $D_2$ and $D_3$ in infantile rickets: A comparison of their therapeutic efficiency,** N. Morris and M. M. Stevenson (*Lancet [London], 1939, II, No. 27, pp. 876–879, figs. 5*).—Twelve infants and children with active rickets were placed on a standard milk mixture consisting of two-thirds milk, one-third water, and sugar and oat flour in amounts suitable for the age of each patient and were observed for a preliminary 3-week period, during which the subjects were kept on the same side of the ward out of direct sunlight. There being no evidence of spontaneous healing of the rickets at the end of the period, the patients were divided into two groups fairly well paired as to the age distribution of the patients and the expected growth responses. The one group was given vitamin $D_2$ and the other vitamin $D_3$ in amounts per patient equivalent to 2,000 International Units daily. The course of the healing of the active rickets was then followed by serial radiography of the wrists and by the estimation of the plasma phosphatase. "The results revealed no significant difference between the therapeutic effects of these two vitamins on rachitic infants and children."

**Vitamin K** (*Lancet [London], 1939, II, No. 23, pp. 1178, 1179*).—This editorial gives a brief outline of the research on vitamin K, considering in chronological order its discovery and the naming of the compound, the perfection of a biological technic for testing it, the Dam unit of potency, the preparation of rich concentrates, the isolation of vitamin K, tests leading to the elucidation of its chemical structure,

*clinical application of compounds with vitamin K activity, and dietary deficiencies* of the vitamin. Seventeen references are cited.

**Vitamin K potencies of synthetic compounds,** S. A. THAYER, S. B. BINKLEY, D. W. MACCORQUODALE, E. A. DOISY, A. D. EMMETT, R. A. BROWN, and O. D. BIRD (*Jour. Amer. Chem. Soc., 61 (1939), No. 9, p. 2563*).—Of the various compounds that could be administered intravenously in aqueous solution, the most active one found was 1,4-dihydroxy-2-methylnaphthalene, which was found to have a potency of approximately 1,000 Thayer-Doisy units per milligram. It is suggested that this compound, which is easily prepared by reduction of 2-methyl-1,4-naphthoquinone, may prove important for intravenous vitamin K therapy.

Several quinones previously studies (E. S. R., 83, p. 16) were re-assayed, and the earlier results were confirmed except in the case of 2-methyl-1,4-naphthoquinone. In the present tests this compound, assayed by the Thayer-Doisy method (E. S. R., 81, p. 406), had a potency of 1,000 Thayer-Doisy units per milligram; this agrees with the value previously assigned to the natural vitamin $K_1$ (E. S. R., 82, p. 89), and confirms the results of Ansbacher and Fernholz (E. S. R., 83, p. 14). It is suggested that 2-methyl-1,4-naphthoquinone should be adopted as a basic standard for the assay of vitamin K, since it is readily obtained in the pure state, has a definite melting point, and is relatively stable. The unit could be defined as the specific vitamin K activity of 1 $\mu$g of the pure compound.

**Vitamin P,** H. SCARBOROUGH (*Biochem. Jour., 33 (1939), No. 9, pp. 1400–1407, figs. 7*).—The conflicting evidence concerning the existence of a capillary fragility control factor, vitamin P, as first announced by Szent-Györgyi and coworkers, is reviewed, with the conclusion that "the reality of such a vitamin cannot be maintained on the basis of the published work." However, new evidence from clinical material is presented, demonstrating the existence of such a factor. Seven case reports are given as typical examples from a larger number showing abnormal capillary fragility, as determined by either the positive or negative pressure method, which responded to treatment with one or another of three different extracts containing flavanones from certain fruit sources but not ascorbic acid. The nature of the material producing this effect has not been determined, but it has been shown to be active when given by mouth, by intravenous injection, or through the rectum.

**The V-factor content and oxygen consumption of tissues of the normal and blacktongue dog,** H. I. KOHN, J. R. KLEIN, and W. J. DANN (*Biochem. Jour., 33 (1939), No. 9, pp. 1432–1442, figs. 2*).—*To determine whether or not* there is any connection between the two functions of nicotinic acid (1) to act as a vitamin for a number of species of mammals and bacteria and (2) as nicotinamide to be a part of two coenzymes, the authors have determined the content of the V-factor (E. S. R., 82, p. 710), which is used as a measure of coenzyme, in the tissues of normal dogs and dogs suffering from acute deficiency of nicotinic acid (blacktongue) and have measured in vitro the $O_2$ consumption of some of these tissues in the presence of suitable substrates.

In dogs with acute blacktongue the concentration of coenzymelike substances was 70 percent lower in the liver and 35 percent lower in striated muscle than in dogs receiving liberal or large amounts of nicotinic acid. In dogs just cured of blacktongue the liver and muscles were 45 and 25 percent lower, respectively. No difference was found in the other tissues examined, which included brain, heart, kidney, pancreas, and blood. The decreased coenzyme content in the liver in blacktongue dogs was accompanied by an increase of 35 percent in $O_2$ consumption. In the kidneys, although the coenzyme content was unchanged, the ability

to oxidize lactate was decreased by 50 percent. The percentage of coenzyme in the reduced form was increased in most tissues except the brain and kidney.

These results are considered to afford no evidence that blacktongue results from a generalized decrease of coenzyme levels in the tissues. Two possibilities in explanation of the definite reduction in level of coenzyme in striated muscle and liver and changes in the oxidative metabolism of liver, muscle, and kidney are suggested. "When the V-factor level of the liver is reduced below a certain limit, some reaction upon which the maintenance of health depends is impaired because sufficient coenzyme is not available. Nicotinic acid enters the metabolism in essential ways as yet unknown." It is pointed out that these results contrast sharply with those reported for vitamin $B_1$ deficiency where the level falls very markedly in brain, heart, muscle, and liver and is accompanied by a decrease in the activity of the coenzyme formed from this vitamin.

***The synthesis of cozymase and of factor V from nicotinic acid by the human erythrocyte in vitro and in vivo***, H. I. Kohn and J. R. Klein (*Jour. Biol. Chem., 130 (1939), No. 1, pp. 1–11, figs. 2*).—In these experiments the content of factor V in the erythrocytes was determined by the method of Kohn (E. S. R., 82, p. 710). Since lactate oxidation is mediated by cozymase and glucose oxidation by coenzyme II, the content of these two enzymes was determined by measuring in the Warburg apparatus the rate of oxidation of added lactate and glucose by the washed corpuscles in the presence of methylene blue which served as an autoxidizable carrier. A correction was applied for the oxygen consumed in the formation of methemoglobin, and due allowance was made for the oxidation rate of the blank. (This was appreciable, since the washing of the corpuscles was not sufficient to remove all of the glucose).

The administration of nicotinic acid to two subjects, one normal, the other a pellagrin, was followed in each case by an increase in factor V, by an increased rate of oxidation of lactate, indicating an increase of cozymase in the erythrocytes, and by no change in the rate of oxidation of the glucose. Similarly, when fresh defibrinated blood was incubated under sterile conditions with nicotinic acid, there was an increase in the factor V content of the erythrocytes and the rate of oxidation of lactate, although the glucose oxidation was not affected by the nicotinic acid. These experiments indicated that the human erythrocyte can synthesize factor V from nicotinic acid in vitro as well as in vivo.

The relation between factor V and the rate of oxidation of lactate was not entirely simple, however, either in vivo or in vitro. In the former case the lactate oxidation rate failed to follow the factor V level when the latter was above 130 cozymase equivalents; in the in vitro experiments the synthetic reactions depended on the initial level of factor V. Synthesis, when the level was normal, occurred but not when it was high, probably because nicotinic acid was no longer the limiting factor, other materials for the synthesis having been exhausted.

**Synthesis of coenzymes I and II**, S. P. and R. W. Vilter and T. D. Spies (*Nature [London], 144 (1939), No. 3657, p. 943*).—In the experiments reported briefly 1 cc. of venous blood (from normal or leukemic persons) or its hematocrit equivalent of red blood cells (obtained by repeated washing to separate these cells, the white blood cells, and the serum) was incubated for 18 hr. with an equal volume of saline containing 0.25 mg. of nicotinic acid amide per cubic centimeter. Control tubes with no nicotinic acid amide were similarly incubated with an equal volume of saline. The concentrations of coenzymes I and II were found to be doubled in the blood after incubation with the nicotinic acid amide, but in the case of the red blood cells suspended in saline or serum

no increase was observed in the coenzyme concentration. In a suspension of white cells (from the blood of patients with leukemia) similarly incubated with nicotinic acid amide there was a decided increase in the concentration of coenzymes I and II. These results are considered to suggest that nucleated cells are essential for the synthesis of these enzymes. This view is in contrast to that of Kohn and Klein noted above, who concluded from their findings that red blood cells synthesized the coenzymes.

**Nicotinic acid in the cure of pellagra** [trans. title], F. MANCINI, M. DELLA CORTE, and V. LEONE (*Quad. Nutr., 6 (1939), No. 4, pp. 374–393, figs. 14*).—Case reports are presented and summarized for 50 pellagrins; 27 were treated with nicotinic acid in physiological saline or water injected intravenously or intramuscularly at the rate of 50 mg. daily (some received as much as 300 mg. daily); 23 were given oral doses varying from 100 mg. to as much as 900 mg. daily. In those receiving nicotinic acid by injection the lesions of the mucous membrane, when present, healed upon the second or third injection and with this the asthenia and anorexia also vanished. The nervous manifestations lessened in both cases having such symptoms. Erythema subsided in 4–5 days; desquamation was eliminated in 15–20 days. Weight increased in 20 cases and was not changed in 7. Patients to whom the nicotinic acid was administered orally responded less satisfactorily. Of those having oral mucous lesions, 1 received no benefit and in the other 2 alleviation of the symptoms began only after 10 days of treatment. Asthenia and anorexia, when present, did not vanish until ameloriation of the cutaneous symptoms. The muscular atrophy of the 1 patient was not modified; delirium on the other hand vanished in 2 days and the skin lesions cleared up in 10–20 days; 2 patients had relapses, the one during treatment and the other 45 days after treatment. It is recommended, therefore, that nicotinic acid in therapeutic use be administered by injection and that oral administration be reserved for preventive treatment over long periods.

**The nature of nutritional diseases occurring in the South**, W. H. SEBRELL (*Milbank Mem. Fund Quart., 17 (1939), No. 4, pp. 358–366*).—This report deals chiefly with the pellagra problems in the South along the same lines as in the paper noted below.

**Public health implications of recent research in pellagra and ariboflavinosis**, W. H. SEBRELL (*Jour. Home Econ., 31 (1939), No. 8, pp. 530–536*).—Following a brief review of the history of the etiology and treatment of pellagra from the original discovery of the disease in Spain 200 yr. ago to Goldberger's proof of the vitamin deficiency nature of the disease, the author discusses the present status of the relation of the members of the vitamin B complex to pellagra with the differentiation of the symptoms due to lack of nicotinic acid from those due to lack of riboflavin, and calls attention to current problems concerning endemic pellagra in the South. Health education and crop diversification are considered the most important factors in the reduction of pellagra incidence, with the use of dried yeast and nicotinic acid as palliatives.

## TEXTILES AND CLOTHING

**Progress in textile research from the consumer point of view**, P. B. MACK. (Pa. State Col.). (*Amer. Dyestuff Rptr., 28 (1939), No. 24, pp. P696–P699*).—This discussion, presented as an address, is concerned with the research studies on textiles that have been planned and carried out distinctly from the consumer point of view. The lines of investigation have dealt with (1) accuracy of sales information secured by the ultimate consumer on the retail market, (2) performance of fabrics secured on the retail market as judged by laboratory and wearing

tests, and (3) technical studies on the relationship of fabric performance to fabric construction, including fiber composition, fabric construction, and chemical composition of the dye. A survey of such studies, as carried on in various colleges, universities, the U. S. D. A. Bureau of Home Economics, and the U. S. Bureau of Standards, is presented, together with brief indications as to the findings.

**Textile testing: Physical, chemical, and microscopical,** J. H. Skinkle (*New York: Chem. Pub. Co., Inc., 1940, pp. IX+267+[4], figs. 63*).—This is essentially a book of methods. Under physical testing, methods are described for moisture determination, various fiber, yarn, and fabric tests, and strength and stretch testing of fibers, yarns, and fabrics. Chemical methods are given for testing for inorganic and organic extraneous matters, fiber mixtures, and swelling and damage in cellulose fibers, wool, and silk. Microscopical tests are described for identifying starches and fibers, for determining quality and damage, and for quantitatively analyzing fiber blends. Where several methods are available, the one considered best is given in detail, and other methods are given in less detail or are merely noted. A list of references is given at the end of each test.

**Identification of the newer textile fibers,** J. H. Skinkle (*Amer. Dyestuff Rptr., 28 (1939), No. 24, pp. P694, P695*).—Based on differences in general chemical behavior and microscopic appearance, a scheme is presented for the separation and identification of glass fiber, casein wool, mixtures of viscose and casein of the cisalfa type, nylon, and vinyl resin type fibers. The 11 tests employed in this separation involve burning, solubility, and dyeing tests and microscopic examination.

**Pectic substance in cotton and its relation to the properties of the fiber,** R. L. Whistler, A. R. Martin, and M. Harris (*Jour. Res. Natl. Bur. Standards [U. S.], 24 (1940), No. 5, pp. 555–565, fig. 1*).—Evidence presented indicated that a pectin-cellulose compound does not exist in native cotton fibers and that the pectic substance is present as the insoluble salt of polyvalent ions. Replacement of these ions by sodium or ammonium renders the pectic substance soluble. Cotton freed of pectic substance with alkali showed no significant change in tensile strength or in viscosity, whereas treatment of the fibers with acids, which removed only a small proportion of the pectic substance, produced an appreciable lowering of these two properties. When dewaxed fibers were dispersed in cuprammonium hydroxide solutions, a small portion remained insoluble, and it consisted practically entirely of pectic substance. The conclusion that pectic substance does not contribute to the viscosity of cuprammonium dispersions of cotton was substantiated by determinations of the viscosities of cuprammonium solutions receiving added pectic material from different sources.

**Recent developments in methods for shrinkproofing wool,** B. A. Harold (*Amer. Dyestuff Rptr., 28 (1939), No. 24, pp. 683–685, 704*).—This is a brief review of various methods that have been tried, with indications as to the effectiveness for shrinkproofing and the suitability from the standpoint of damage to fiber. A short bibliography is given.

**Technical evaluation of textile finishing treatments: Flexibility and drape as measurable properties of fabric,** L. J. Winn and E. R. Schwarz (*Amer. Dyestuff Rptr., 28 (1939), No. 24, pp. P688–P694, figs. 6*).—In this study a series of 10 fabrics ranging from organdie through tracing cloth to a stiff-finished cotton material and varying in weight from 5 to 45 mg. per square centimeter were compared for bending length, rigidity, bending modulus, bending torque, chord length, and radius of curvature. These tests were made by means of the drape tester, the hanging loop, the Gurley stiffness tester, and the Schiefer flexometer. A brief summary of the testing methods and the re-

sults by each method are given. In making the comparisons between the various materials in the series, the Spearman rating system was used. This system, discussed and illustrated with the present data, takes the form of calculating the correlation coefficient for a series of ranked observations. It is pointed out that the various technics employed measure in each case differences in flexibility which are difficult to determine in any ordinary way. The results obtained indicate that the drape test method was the most sensitive of the series, being the only method which would satisfactorily and consistently distinguish between bending of the fabric with face toward the concave and the convex sides, respectively.

## HOME MANAGEMENT AND EQUIPMENT

**What the farm woman can do to improve the economic status of her family,** D. DICKINS (*Mississippi Sta. Bul. 346 (1940), pp. 18, figs. 5; also in Miss. Farm Res.* [*Mississippi Sta.*], *3 (1940), No. 7, pp. 3–6, figs. 5*).—Five means whereby farm women in Mississippi can help (and in many instances are helping) improve the economic status of their families are discussed, with illustrations from the author's research publications (E. S. R., 66, p. 694; 78, p. 128; 79, p. 142) and unpublished work of good and poor practices along lines of the suggestions made. These include using time and money efficiently, improving the family health, acting in the capacity of partner in the farm business, engaging in nonagricultural pursuits, and guiding sons and daughters in such a way that they will make a valuable economic contribution in the future.

**Family income and expenditures: Middle Atlantic and North Central Region and New England Region.—I, Family income,** D. MONROE, E. PHELPS, and I. G. SWISHER (*U. S. Dept. Agr., Misc. Pub. 370 (1940), pp. IV+447, figs. 12*).—This report, the fourth in the series on family income and expenditures (E. S. R., 83, p. 286), is the third in the urban and village series. It is based on a survey of small city and village families in selected communities in the Middle Atlantic, North Central, and New England regions, and presents information similar to that previously reported for similar groups in the Pacific (E. S. R., 81, p. 603) and the Plains and Mountain regions (E. S. R., 82, p. 287). Part 1 reports data on income and composition of the native-white unbroken families studied, while part 2 deals with the distribution of total family expenditures and the relationship between family income, expenditures, and net worth.

**The economic status of 436 families of Missouri clerical workers and wage earners,** J. V. COLES and L. HIESER (*Missouri Sta. Res. Bul. 318 (1940), pp. 80, figs. 11*).—This study is based on the data obtained from schedules secured by the U. S. D. A. Bureau of Home Economics for the consumer purchases study noted above, and included families of 279 wage earners and 157 clerical workers selected at random in Moberly and Columbia, Mo. These towns, the latter primarily an educational center and the other an industrialized community, were selected as representative small cities of less than 15,000 population located in a predominantly agricultural area typical of the State and having close relationship with families living on farms. The findings summarized from the family and expenditure schedules obtained by the interview method are discussed at length, each factor in relation to the others.

Of particular interest is the section devoted to implications of the data to families and to educators. Here it is pointed out that plans for the future welfare of families must be made within the limits of their particular incomes, the majority of which are below $1,500, with many under $1,000. Supplementing these small incomes with nonmoney income through wise use of home skills and energy thus becomes important. Future plans, it is further indicated, must give

special attention to the larger families where increase in income is seldom commensurate with increase in size; must recognize that expense for food is the most important item at all low-income levels, that household operation is not a minor item and should be studied for effective expenditures, and that goods received should give the maximum of satisfaction for the money expended, this being a particular problem in the matter of clothing. The necessity for evaluating expenditures for different groups of commodities and services and the necessity for budgeting effectively and purchasing wisely become very important when incomes are low. Home ownership, medical care, life insurance, mortgages on future income, credit, emergencies, and small savings are also considered with reference to low incomes.

**[Household equipment research by the Nebraska Station]** (*Nebraska Sta. Rpt. [1939], p. 52*).—Progress reports are given on an investigation of the efficiency of top burners and ovens of gasoline stoves and on the adaptation of an electric food mixer controlled by a centrifugal switch to different types of beaters.

**Storage facilities for personal belongings in the home management house,** M. Wilson and R. Morrison. (Oreg. State Col.). (*Jour. Home Econ., 32 (1940), No. 5, pp. 321–329, figs. 3*).—Recommendations for storage space desirable in a home management house for the personal possessions of the students, as based on lists submitted by home economics students of garments and personal belongings customarily taken to the house and on observations made by a student supervisor are given, with dimensional diagrams for bedroom and central closets, dressers, and study tables and inside depths and lengths of dresser drawers. Tables are also given of dimensions of garments and accessories as arranged for storage and frequency distribution of students with varying requirements.

**Farm freezing cabinets now available,** C. W. DuBois (*Farm Res. [New York State Sta.], 6 (1940), No. 3, pp. 1, 2, figs. 3*).—This brief article notes the rapid increase in frozen locker storage plants throughout the country and the development as an outgrowth of the locker idea of individual farm freezing and storage units. Attention is called to Bulletin 690 (E. S. R., 83, p. 701).

## MISCELLANEOUS

**The land grant college movement,** F. B. Mumford (*Missouri Sta. Bul. 419 (1940), pp. 140*).—This bulletin is discussed editorially on page 721.

**Report on the agricultural experiment stations, 1939,** J. T. Jardine, F. D. Fromme, et al. (*U. S. Dept. Agr., Off. Expt. Stas., Rpt. Agr. Expt. Stas., 1939, pp. 265*).—This report has been discussed editorially (E. S. R., 83, p. 145).

**Annual Report of the Massachusetts Agricultural Experiment Station, 1939,** *F. J. Sievers et al.* (*Massachusetts Sta. Bul. 369 (1940), pp. 104, figs. 10*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Abstracts are also included on Cranberry Juice: Properties and Manufacture, by C. C. Rice, C. R. Fellers, and J. A. Clague (p. 99); Effect of Particle Size on the Solubility of Magnesium in Dolomite and Magnesic Limestone in 4 Percent Citric Acid Solution Adjusted to pH 4.0 With Ammonium Hydroxide, by J. W. Kuzmeski (pp. 100, 101); Factors To Be Considered in Selecting Chocolate-Flavored Milk, by W. S. Mueller (p. 101); New and Easy Ways to Prevent Damping-Off of Seedlings, by W. L. Doran (p. 102); and Report on Zinc, by E. B. Holland and W. S. Ritchie (p. 102).

**Fifty-third Annual Report of [Nebraska Station, 1939],** W. W. Burr (*Nebraska Sta. Rpt. [1939], pp. 68*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

**Agricultural research in New Hampshire: Annual report of the director of New Hampshire Agricultural Experiment Station for the year 1939,** M. G. Eastman (*New Hampshire Sta. Bul. 319 (1940), pp. 46*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

***Colorado Farm Bulletin,* [July–September 1940]** (*Colo. Farm Bul.* [*Colorado Sta.*], *2 (1940), No. 3, pp. 20, figs. 4*).—In addition to several articles noted elsewhere in this issue and the customary announcements and news notes, this number includes Claims Regarding Wheat-Wild Rye Hybrid Grass Found To Be Without Foundation, by R. M. Weihing and D. W. Robertson (p. 3); Study Shows Trend in Agricultural Population (p. 12); Another Check on Potato Ring Rot Found (p. 18); and Table Provides Short Cut in Calculation of Irrigation Costs, Examples Are Cited, by R. T. Burdick (p. 19).

**Bimonthly Bulletin, [July 1940]**, edited by W. C. Palmer (*North Dakota Sta. Bimo. Bul., 2 (1940), No. 6, pp. 23, figs. 9*).—In addition to several articles noted elsewhere in this issue, there are included North Dakota Plants of the Carrot Family, by O. A. Stevens (pp. 4, 5); When Is Sudan Grass Safe as a Feed for Livestock? by F. W. Christensen (p. 19); and the customary abstracts.

**Abstracts of Bulletins 567–580, Circulars 83–85, and other publications during 1939,** A. D. Jackson (*Texas Sta. Cir. 88 (1940), pp. 47*).—In addition to abstracts of the station's own publications as indicated, this circular contains abstracts of articles contributed by members of the staff for publication elsewhere. Some of these have been previously abstracted or are noted elsewhere in this issue, but there are also abstracts of the following: A Technique for Making Photomicrographic Prints in Color, by H. A. Smith (pp. 26, 27); Notes on Texas Plants, by V. L. Cory (p. 28); and Observations on Chromosome Elimination in the Germ Cells of *Sciara ocellaris*, by R. O. Berry (p. 28).

**Citations to literature in the Journal of Agricultural Research, technical bulletins, circulars, and miscellaneous publications (other than bibliographies),** C. Whitlock (*U. S. Dept. Agr.*, [*1940*], *pp. 17*).—Directions and examples are given.

# NOTES

**Arkansas University and Station.**—Martin Nelson, associated with the agronomic work of the institution since 1908, dean and director from 1913 to 1920, and subsequently head of the department of agronomy and vice dean, has retired. The resignations are noted of Dr. Lincoln Opper, assistant professor and assistant in agricultural chemistry; Olivia Smenner, instructor in home economics and assistant in home economics research; J. V. Highfill, assistant to the dean and director; Claude J. Byrd, assistant director in charge of the Cotton Substation; and Dr. Albert Miller, instructor in entomology and plant pathology. New staff members include Helen Cannon and Ruth A. Allen as assistant professor and instructor in home economics, respectively; Dr. T. J. Claydon, Dr. C. H. Anthony, and F. H. Vogel, instructors in dairy manufacturing, veterinary science, and forestry, respectively; Max A. Jeter, assistant to the dean and director; and J. E. Walker, assistant director in charge of the Cotton Substation.

**Connecticut Stations.**—Dr. Roger B. Friend, State entomologist and chief of the department of entomology, has been appointed assistant director of the State Station and will serve as acting director in the State and Storrs Stations during the leave of absence of Director W. L. Slate. Dr. C. I. Bliss has been appointed biometrician in the State Station.

**Maryland University and Station.**—C. E. Temple, professor of plant pathology and plant pathologist, retired October 1 and has been succeeded by Dr. R. A. Jehle, associate in plant pathology.

**Massachusetts Station.**—Recent appointments include Dr. Dale H. Sieling, assistant professor of agricultural chemistry in Purdue University as research professor in chemistry; Sargent Russell, research assistant in agricultural economics; and Mabelle Booth as laboratory assistant in agricultural economics.

**Montana College and Station.**—Appointments effective September 1 include Layton S. Thompson as instructor and assistant in agricultural economics and G. Curtis Hughes as instructor and assistant in animal industry.

**New Hampshire University and Station.**—Arval L. Erikson has been appointed assistant to the director of the station, assistant agricultural economist, and assistant professor of agricultural economics. Other appointments include Dr. James H. Gillespie as instructor in poultry husbandry in the university and assistant poultry pathologist in the station and Dr. Jan Kazimierz Strzemienski of the Jagellonian University of Kraków, Poland, for temporary analytical work on the chemical composition of grasses.

**New Mexico Station.**—D. E. Wasson, assistant in agricultural economics, resigned October 1 to accept a position with the U. S. D. A. Farm Security Administration.

**Pennsylvania College and Station.**—Dr. Frederick P. Weaver, associated with the institution since 1910 and professor of agricultural economics since 1925, died September 5, aged 68 years. He was a native of Pennsylvania, graduating from the college in 1914 and receiving the M. S. and Ph. D. degrees from Cornell University in 1923 and 1930.

# INDEX OF NAMES


Aamodt, O. S., 333.
Abarbanel, A. R., 330.
Abbasy, M. A., 277.
Abbott, E. V., 505.
Abbott, O. D., 274, 699.
Abderhalden, E., 850.
Abderhalden, R., 850.
Abegg, F. A., 354.
Abrahamson, E. M., 746.
Abramowitz, A. A., 45.
Accousti, N. J., 396.
Ackerman, J., 554, 691.
Ackerman, W. F., 432.
Ackerman, W. T., 805.
Ackerson, C. W., 538.
Ackert, J. E., 254, 255, 821.
Acree, S. F., 299.
Adair, L. A., 779, 780.
Adams, G., 699.
Adams, R. L., 691, 695.
Adams, W. L., 594.
Addy, C. E., 576.
Adler, F. H., 850.
Adolph, W. H., 273.
Adsuar, J., 617, 625.
Afanasiev, M. M., 344.
Agnew, M. A., 432, 559.
Agostini, A., 332.
Ahlgren, G. H., 619.
Ahlgren, H. L., 333.
Ahlquist, R. P., 575.
Ahmann, C. F., 274, 699.
Ahrens, W. E., 512.
Aicher, L. C., 384.
Aiken, J. M., 50, 196.
Aikin, A., 429.
Aikman, J. M., 745.
Akamine, E. K., 479, 764.
Alamo Ybarra, R., 5.
Albert, A. R., 333, 335.
Albert, W. B., 501.
Albertson, F. W., 66.
Albrecht, W. A., 159, 164, 165.
Alcorn, J. R., 514.
Alden, C. H., 658.
Alder, B., 535.
Alderman, W. H., 338, 495.
Alderson, W. L., Jr., 585.
Aldrich, K. F., 500.
Aldrich, W. W., 198.
Alexander, J., 462.
Alexander, L. M., 233.
Alexander, O., 300.
Alfredson, B. V., 807.
Alicata, J. E., 401, 518, 825.
Allard, H. A., 216.
Allbaugh, L. G., 386.
Allen, C. E., 470.
Allen, H. W., 371.
Allen, N., 519.
Allen, P. W., 530.
Allen, R. A., 864.
Allen, R. H., 555.
Allen, T. C., 344, 363, 364.
Alley, O. E., 181.
Allin, B. W., 405.
Allinger, H. W., 337.
Allison, F. E., 37, 322, 463, 467.
Allison, R. V., 25, 54, 592.
Allman, R., 386.
Allman, S. L., 709.
Allmendinger, D. F., 190, 367, 795.
Allred, C. E., 118, 256, 265, 553, 554, 557.
Allsopp, A., 466.
Almquist, H. J., 14, 386, 585, 735, 736, 812.
Alp, H. H., 833.
Alperovich, K. B., 611.
Alsberg, C. L., 404.
Alsop, A., 329.
Alston, J. M., 822.
Altmann, M., 388.
Altschuler, W. E., 43.
Altstatt, G. E., 206, 782.
Amatt, J., 491.
Amberg, E. J., 854.
Amies, C. R., 820.
Amos, J. M., 85.
Anagnostu, J., 709.
Andersen, A. A., 607.
Anderson, C. S., 124.
Anderson, D., 117.
Anderson, E., 585, 596.
Anderson, E. J., 379.
Anderson, G. W., 529, 535, 540, 675.
Anderson, H. D., 95, 575, 669.
Anderson, H. W., 338, 508, 509.
Anderson, J. E., 295.
Anderson, J. P., 349.
Anderson, K., 819.
Anderson, L. D., 368, 369.
Anderson, M., 275.
Anderson, M. S., 742.
Anderson, O. W., Jr., 665.
Anderson, P. J., 354, 485, 486, 505.
Anderson, T. F., 468.
Anderson, W. A., 840.
Anderson, W. S., 48, 185, 490.
Andersson, E., 172.
Andison, H., 364.
Andre, F., 432.
Andrewes, C. H., 820.
Andrews, F. N., 144, 179, 182.
Andrews, F. S., 488.
Andrews, J., 245.
Andrews, W. B., 55, 168, 455, 479, 761.
Andross, M., 703.
Ångström, A., 21.
Annand, P. N., 516, 652.
Ansbacher, S., 12, 14, 139, 736.
Anthony, C. H., 864.
Anthony, E. L., 391.
Anthony, J. L., 48.
Antopol, W., 568.
Appleman, M. D., 164.
Appleton, J. B., 699.
Apodaca, J. L., 120.
Arbuckle, W. S., 238, 673, 674.
Archer, W. A., 68.
Archibald, J. G., 813.
Arens, K., 35.
Aring, C. D., 711.
Ark, P. A., 79.
Arkhangelskaya, M. N., 362.
Armino, J., 131.
Armstrong, C., 107.
Armstrong, G. M., 480, 501, 504.
Arndt, C. H., 501.
Arney, S. E., 34.
Arnold, A., 95, 126, 383, 531.
Arnold, F., 608.
Arnold, H. A., 403.
Arnold, L. J., 731.
Arnold, P. T. D., 608, 665, 675.
Arnold, R. B., 673.
Arnon, D. I., 173.
Aron, H. C. S., 138.
Arrillaga, J. G., 625.
Arroyo, R., 581.
Artschwager, E., 746.
Arzuaga, J. G., 472.
Asami, N., 105.
Aschaffenburg, R., 440.

Ascham, L., 274.
Aschehoug, V., 717.
Ascoli, A., 822.
Asghar, A. G., 807.
Ashby, E., 32.
Ashby, H., 32.
Ashby, R. C., 381.
Ashby, W., 50.
Ashe, W. F., 281.
Ashley, T. E., 61, 193, 491, 493.
Ashworth, J. T., 651.
Askew, H. O., 356.
Asmundson, V. S., 44, 611.
Asnitskaya (Asnitzkaya), E. A., 784.
Astwood, E. B., 613.
Atanasoff, D., 346.
Atkin, L., 417, 444, 468.
Atkins, I. M., 344, 503.
Atkins, W. R. G., 305.
Atkinson, F. E., 193, 194.
Atkinson, H. B., 21.
Attia, R., 517.
Auerbach, C., 180, 327.
Augustine, D. L., 821.
Augustine, D. W., 745.
Aull, G. H., 551, 838.
Auten, J. T., 342.
Avens, A. W., 86, 584.
Avery, A. G., 456.
Avery, G. S., Jr., 726.
Avery, J. L., 106, 397.
Axelrod, A. E., 126, 133, 531, 712, 713.
Axelsson, J. J., 386.
Axtmayer, J. H., 666, 805, 806.
Ayers, T. T., 76, 641.
Aykroyd, W. R., 425.
Ayres, A. S., 448
Ayres, J. C., 643.

Babbitt, J. D., 687.
Babcock, E. B., 335.
Babcock, S. H., Jr., 667.
Babler, B. J., 581.
Bacharach, A. L., 284.
Bache-Wiig, S., 202.
Backus, M. P., 346.
Bacon, L. B., 695.
Bacsich, P., 757.
Badenhorst, F. J. G., 96.
Badhwar, R. L., 396.
Baerg, W. J., 84.
Baglioni, S., 707.
Bailey, A. J., 303.
Bailey, B., 427, 717.
Bailey, C. H., 9, 10, 293, 294, 411, 441.
Bailey, H. L., 218.
Bailey, J. E., 189.
Bailey, J. S., 771.
Bailey, L. F., 169.
Bailey, L. H., 168, 288.
Bailey, R. M., 333, 335.
Bailey, R. Y., 188.
Bailey, S., 570.
Bailey, S. F., 86, 655.
Bailey, W. R., 690.
Bain, H. F., 214.
Baines, R. C., 355, 356.
Baitsell, G. A., 204, 205.
Baker, A. C., 93.
Baker, A. Z., 419.
Baker, E. E., 155, 346.
Baker, G. L., 6, 231.
Baker, M. C., 822.
Baker, R. E. D., 347, 358.
Baker, R. L., 557, 835.
Baker, Z., 467.
Bakke, A. L., 50.
Bakken, H. H., 117.
Balachowsky, A., 223.
Baldwin, I. L., 344, 346, 456
Baldwin, W. H., 153.
Ball, E. G., 421.
Ballard, S. S., 437, 448.
Ballinger, R. A., 261, 262
Baló, J., 820.
Baltzer, A. C., 100.
Bandemer, S. L., 387, 388, 389.
Bandier, E., 298.
Banerji, G. G., 851.
Bannon, J., 157.
Barbee, O. E., 185.
Barbella, N. K., 381.
Barber, G. W., 91, 216, 653
Barbour, T., 289.
Bare, C. O., 519, 657.
Barelare, B., Jr., 132.
Barger, W. R., 63.
Barker, H. D., 207, 780.
Barker, S. H., 42.
Barmore, M. A., 296.
Barnard, J. D., 325.
Bärner, J., 32.
Barnes, B. S., 304, 738.
Barnes, D. F., 85.
Barnes, F. F., 29.
Barnes, H. F., 799.
Barnes, R. H., 667.
Barnes, W. C., 480, 488, 501.
Barnett, R. J., 338.
Barnette, R. M., 450, 592, 616, 634.
Barnhart, C. S., 520.
Barnhart, J. H., 204.
Barott, H. G., 386.
Barr, C. G., 243, 623.
Barr, G. W., 260.
Barr, H. F., 745.
Barre, H. J., 50, 550.
Barreto, A., 22.
Barron, E. S. G., 467.
Barrons, K. C., 75, 782.
Barrows, F. L., 35, 605.
Barss, H. P., 782.
Barthell, R., 699.
Bartholdi, W. L., 719.
Bartholomew, R. P., 22.
Bartlett, H. H., 596.
Bartlett, J. B., 448.
Bartlett, J. W., 178, 240, 608, 614, 756.
Bartlett, S., 814.
Barton, G. T., 116.
Barton, L. V., 749.
Bartoo, R. A., 779.
Bass, T. C., 454.
Bateman, G. Q., 482, 536.
Baten, W. D., 429.
Bates, R. W., 478.
Batjer, L. P., 492.
Batson, F. S., 64, 496, 779.
Baucke, J., 566.
Bauer, J. H., 819.
Bauernfeind, J. C., 534.
Baur, K., 160, 190, 202, 217, 238.
Bausman, R. O., 116.
Baver, L. D., 20, 25, 159, 160, 162, 575.
Bawa, H. S., 249.
Bawden, F. C., 345, 346.
Baxter, D. V., 512, 785.
Bayfield, E. G., 770.
Bayles, B. B., 756.
Bayne-Jones, S., 677.
Beach, B. A., 823.
Beach, J. R., 253.
Beal, M., 117.
Beale, H. P., 346.
Bean, W. B., 281.
Bear, R. S., 6.
Beard, D., 251, 399.
Beard, F. J., 96, 120.
Beard, J. W., 251, 399.
Beard, R. L., 373, 652.
Beare, J. A., 61.
Bearse, G. E., 236, 534.
Beasley, J. O., 472, 755.
Beattie, M., 679.
Beaty, H. H., 828.
Beaudette, F. R., 255, 678, 685, 819.
Beaumont, A. B., 741.
Beaumont, J. H., 488, 574.
Bechdel, S. I., 99, 100, 670, 675, 831.
Beck, F. W., 117.
Beck, W. A., 173, 317.
Beckenbach, J. R., 460, 616, 624, 634.
Becker, E., 561.
Becker, E. R., 547.
Becker, H., 346.
Becker, H. C., 443.
Becker, J. A., 115.
Becker, J. E., 415.
Becker, R. B., 284, 608, 665, 675.
Becker, W. B., 796.
Beckman, M., 229.
Bedenbaugh, P. G., 528, 686.
Bedford, C. L., 154.
Beetle, A. A., 169.

Beilby, O. J., 387.
Bell, C. E., 592.
Bell, D. S., 381.
Bell, E. J., 107.
Bell, H. P., 195.
Bell, T. D., 42.
Beller, K., 820.
Bellinson, H. R., 578.
Belova, O. D., 362.
Bender, R. C., 445.
Bender, W. H., 740.
Bendixen, H. A., 238, 392, 818.
Benedict, M. B., 115, 697.
Benne, 174.
Bennett, A. H., 549.
Bennett, B. H., 387.
Bennett, C. A., 831.
Bennett, C. C., 480, 501.
Bennett, C. W., 642.
Bennett, E., 314, 725, 771.
Bennett, H. H., 3.
Bennett, H. O., 775.
Bennett, H. W., 48, 185, 479, 617, 759, 805.
Benson, L., 324.
Benson, R. B., 228.
Bentley, R. C., 116.
Bercaw, L. O., 834.
Berg, C. P., 667.
Berg, H. A., 117.
Berge, T. O., 742.
Bergen, W. von, 717.
Berger, J., 6.
Berger, K. C., 306, 451.
Bergman, A. J., 182, 288, 328.
Bergman, H. F., 771, 783.
Berkeley, G. H., 346, 505.
Berliner, V. R., 97, 178, 182.
Bernal, J. D., 345.
Bernhardt, J., 693.
Bernkopf, H., 820.
Berry, G. P., 820.
Berry, M. H., 675.
Berry, P. A., 216.
Berry, R. O., 184, 756, 863.
Bertramson, B. R., 163.
Bessey, R. F., 699.
Bethel, R., 156.
Bethell, F. H., 413.
Bethke, R. M., 236, 385.
Beule, J. D., 793.
Beveridge, W. I. B., 823.
Bhaduri, P. N., 751.
Bhattacharjee, J., 218.
Bice, C. M., 518, 528.
Biddulph, O., 174, 330.
Biester, A., 140.
Biester, H. E., 250, 541.
Bigger, J. H., 656, 798.
Bigwood, E. J., 467.
Bilford, H. R., 126.
Binkley, A. M., 190.
Binkley, S. B., 13, 15, 16, 45, 586, 733, 734, 737, 857.
Bird, H. R., 386, 812.
Bird, J. J., 481, 561.
Bird, O. D., 857.
Bird, R. D., 516.
Bird, S., 387.
Birdsall, B. J., 23.
Birkhaug, K., 822.
Birkinshaw, J. H., 362.
Bisbey, B., 229.
Bissell, T. L., 519.
Bisson, C. S., 144, 217, 303, 337.
Bissonnette, T. H., 183.
Bitancourt, A. A., 346.
Bizer, E., 388.
Black, A., 271, 807.
Black, L. A., 100.
Black, L. M., 347.
Black, S., 236, 668.
Black, W. H., 233, 381.
Blackmon, G. H., 341, 357, 624.
Blair, A. W., 618.
Blaisdell, D. J., 212.
Blake, M. A., 493, 628.
Blakeslee, A. F., 456.
Blakeslee, L. H., 381, 560.
Blanc, M. L., 740.
Blanchard, R. A., 798.
Blandau, R. J., 331.
Blank, L. M., 779, 781.
Blaser, R. E., 482, 592, 616.
Bleeker, W., 157.
Blickle, R. L., 796
Blish, M. J., 440, 441, 533.
Bliss, C. I., 864.
Bliss, E. A., 822.
Bloch, I., 699.
Bloch, R., 456, 606.
Blodgett, E. C., 214, 344, 359, 783.
Blodgett, F. M., 353.
Blood, H. L., 635, 782.
Blood, P. T., 760, 761, 832.
Bloom, W., 347.
Blosser, R. H., 554.
Blume, J. M., 30.
Blumenstock, D. I., 20.
Blunn, C. T., 326, 810.
Blyth, J. S. S., 609.
Boatman, J. L., 22.
Bodansky, M., 667.
Bodman, G. B., 162.
Boehm, K., 669.
Boewe, G. H., 782, 783.
Boggess, T. S., 189.
Boggs, M. M., 190, 229, 268.
Bohn, G. W., 78, 201.
Bobonos, N., 467.
Bohren, B. B., 229.
Bohstedt, G., 42, 95, 381, 382, 675.
Boke, N. H., 170.
Bokina, C., 835.
Boley, L. E., 679.
Boling, J. L., 331.
Bollinger, C. O., 889.
Bonde, R., 77, 333, 344.
Bondy, F. F., 83, 519.
Bonner, D. M., 36.
Bonner, J., 36, 172, 318, 455, 462, 468.
Bonnet, J. A., 593.
Bonnett, O. T., 192.
Bonney, M. C., 632.
Bonser, H. J., 118, 554, 557.
Bonsma, J. C., 96.
Booher, L. E., 131, 278, 707.
Booth, M., 864.
Booth, T. O., 678.
Boozer, G. W., 501.
Borchers, R., 667.
Borden, R. J., 485, 621.
Borgen, L., 822.
Borgström, G., 597.
Borland, A. A., 814.
Bormuth, W. D., 117.
Borson, H. J., 810.
Borsook, H., 667.
Borst, H. L., 20.
Borthwick, H. A., 457, 746.
Bortner, C. E., 209.
Bos, L. H., 329.
Boswell, J. G., 747.
Boswell, V. R., 487, 627, 772.
Bosworth, T. J., 247, 678.
Botsford, R. C., 651.
Bottger, G. T., 524.
Bottomley, A. C., 613.
Bottorff, C. A., 805, 823.
Bouchard, A. J., 309.
Boucher, R. V., 388.
Boughton, I. B., 826.
Boulware, J. H., 105.
Bourgin, G. V., 223.
Bourne, A. I., 517, 796.
Bouton, S. M., Jr., 138.
Bouyoucos, G. J., 307.
Bovien, P., 527.
Bowden, R., 563.
Bowen, A. B., 480.
Bowen, D. K., 15.
Bowen, D. M., 15.
Bowers, J. D., 672.
Bowers, M., 270.
Bowie, A., 688.
Bowling, G. A., 608.
Bowman, F. T., 194.
Bowman, J. J., 356.
Bowser, W. E., 449.
Boyce, A. M., 219, 523.
Boyce, E. F., 666.
Boyce, J. H., 482.
Boyce, J. S., 647.
Boyd, E. M., 236.
Boyd, F. T., 616.
Boyd, M. F., 821.
Boyd, O. C., 511, 635, 645, 782.
Boyd, W. C., 181.
Boyd, W. L., 516, 675, 823.
Boyle, L. E., 842.
Boynton, D., 160.

Boysen Jensen, P., 597.
Bracken, A. F., 770.
Bradfield, R., 161.
Bradley, J. C., 215.
Brady, D. E., 178.
Bragg, J. H., 523.
Bramley, A., 174.
Branaman, G. A., 670.
Brandly, C. A., 107.
Brandow, G. E., 115.
Branion, H. D., 286.
Brannen, C. O., 115, 143.
Bratley, C. O., 80, 343.
Bratley, H. E., 634, 650.
Bratzler, J. W., 669, 807.
Braun, E. L., 720.
Braun, H., 467.
Brautlecht, C. A., 302.
Bray, R. H., 167.
Breakey, E. P., 217.
Breed, R. S., 466.
Breese, B. B., Jr., 667.
Bregger, J. T., 630.
Bregger, T., 616.
Breneman, W. R., 46.
Brennen, C. A., 118, 481.
Brenner, S., 708.
Brentzel, W. E., 77.
Bressler, R. G., Jr., 405, 693.
Bressman, E. N., 289.
Brewer, A. K., 174.
Brewer, H. E., 196.
Brief, B. J., 184.
Brier, G. W., 235, 381.
*Brierley, P.*, 71, 598.
Briggs, H. M., 178, 235.
Briggs, L. C., 611.
Briggs, R. C., 402.
Brigham, W. T., 651.
Brigman, H. P., 389.
Brimhall, B., 150.
Brink, R. A., 325, 333, 364, 619.
Britton, W. E., 651.
Brizi, A., 694.
Broadfoot, W. M., 25.
Brody, A. L., 83, 244.
Brody, S., 238.
Bromley, S. W., 218, 367.
Bronfenbrenner, J. J., 394, 467.
Bronson, T. E., 364.
Brooker, M. A., 121.
Brooks, A. N., 624, 634, 779, 781.
Brooks, C. F., 738.
Brooks, J. W., 363, 364.
Brother, G. H., 17.
Brown, A. M., 504.
Brown, A. P., 412, 569.
Brown, B. A., 207, 762.
Brown, B. E., 333.
Brown, C. A., 606.
Brown, C. M., 698.
Brown, D. E., 54.
Brown, E. F., 427.
Brown, E. M., 185.
Brown, G. L., 575.
Brown, H. B., 53, 187, 780, 781.
Brown, H. D., 354.
Brown, H. E., 217.
Brown, H. M., 50.
Brown, H. W., 827.
Brown, J. G., 492.
Brown, M. E., 745.
Brown, N. A., 346, 360, 502.
Brown, R., 747.
Brown, R. A., 667, 857.
Brown, R. G., 745.
Brown, R. L., 160.
Brown, S. M., 26.
Brown, W. A., 386.
Brown, W. C., 673.
Brown, W. H., 673.
Brown, W. L., 473.
Browne, C. A., 231.
Browning, B. R., 159.
Browning, G. M., 300.
Brownlee, A., 530, 686, 820.
Brownlee, D. S., 388.
Brownlee, O., 834.
Broyer, T. C., 319, 456.
Brubaker, D. D., 695.
Bruce, M. R., 118.
Brückmann, G., 562.
Brueckner, H. J., 100.
Bruère, M. B., 67.
Brues, A. M., 615.
Brues, C. T., 225.
*Brüggemann, H.*, 388.
Bruhn, H. D., 42, 114.
Brundage, R. C., 201.
Bruner, D. W., 251, 547, 822.
Brunner, W., 158.
Brunson, M. H., 371.
Bryan, A. A., 6, 50, 68, 69, 113, 745, 755.
*Bryan, C. S.*, 109, 542.
Bryant, J. B., 678.
Bryant, L. R., 338.
Bryson, H. R., 217.
Buchanan, M. T., 144.
Buchanan, R. E., 143, 466.
Buchanan, T. S., 361.
Buchanan, W. D., 377.
Buchholtz, W. F., 575.
Buchwald, C. E., 457.
Buchwald, N. F., 596.
Buck, R. K., 552.
Buckhannan, W. H., 306.
Buckman, M. E., 518.
Buckner, G. D., 388.
Buckner, R. P., 89.
Bue, N., 391.
Bueno, P., 397, 398.
Bugnicourt, F., 596.
Buhrer, E. M., 782.
Bulger, J. W., 227, 526.
Bull, S., 381.
Buller, A. H. R., 346.
Bullis, K. L., 823.
Bullough, W. S., 44.
Bünger, H., 669.
Bunker, J. W. M., 814.
Bunkfeldt, R., 126.
Burack, E., 47.
Burcalow, F. V., 55.
Burckhardt, H., 19.
Burdick, H. O., 612.
Burdick, R. T., 863.
Burgess, A. F., 218, 657.
Burgess, E. D., 374.
Burgess, I. M., 335.
Burgwald, L. H., 241, 673, 674.
Burk, D., 468.
Burk, E. F., 786.
Burk, L. B., 233.
Burke, O. D., 507.
Burkert, G. M., 302.
Burkes, S. C., 745.
Burkey, L. A., 100, 673.
Burkhart, B. A., 302, 303.
Burkholder, C. L., 776.
Burkholder, W. H., 345.
Burkitt, W. H., 229, 381, 719
Burlison, W. L., 381, 763.
Burmister, D. M., 452.
Burnett, L. C., 50.
Burnham, C. R., 41.
Burnside, C. E., 378.
Burr, G. O., 382, 667.
Burr, W. W., 862.
Burrell, A. B., 355, 508.
Burrill, M. W., 46, 477, 478.
*Burris, R. H.*, 40.
Burroughs, E. W., 229, 230.
Burroughs, H. S., 229, 230.
Burroughs, W., 381, 382.
Burt, A. W., 528, 808.
Burton, G. W., 473.
Busbey, R. L., 217.
Bushnell, J., 52, 57.
*Bushnell, L. D.*, 253, 400, 547.
Bushnell, R. J., 609, 652.
Butac, F. L., 519.
Butcher, F. G., 516.
Butkevitsch, V. S., 467.
Butler, O. R., 783, 832.
Butler, R. E., 134.
Butovskii, A. P., 362.
Butt, H.R., 424.
Buttle, G. A. H., 821.
Butz, L. W., 588.
Buxton, J. B., 247.
Buxton, P. A., 524.
Byall, S., 583.
Byers, H. G., 162, 166.
Bylin, R. S., 840.
Byrd, C. J., 864.

Caesar, L., 83.
Cahill, B. J. S., 446.
Cain, C. A., 83.
Cain, J. C., 624.
Caine, G. B., 536.

Calafat, G. R.-, 701.
Calder, K. L., 158.
Caldwell, J., 346.
Caldwell, R. M., 770, 785.
Caldwell, R. W., 810.
Calinisan, M. R., 351.
Callan, E. McC., 224.
Calland, J. W., 78.
Callen, E. O., 468.
Callenbach, J. A., 364.
Callison, E. C., 278, 707.
Camburn, O. M., 667.
Cameron, A. E., 797.
Camerón, E. J., 346.
Cameron, H. S., 111, 542.
Cameron, J. McB., 522.
Cameron, T. W. M., 250, 821.
Camp, A. F., 624.
Camp, J. P., 616.
Camp, W. H., 596.
Campbell, D. M., 677.
Campbell, F. L., 86.
Campbell, H., 134.
Campbell, H. A., 105.
Campbell, H. T., 190.
Campbell, J. A., 48, 79, 383.
Campbell, J. H., 109.
Campbell, K., 730, 854.
Campbell, L., 202.
Campbell, W. P., 15, 299, 586, 735.
Canfield, T. H., 611.
Cannon, C. Y., 674.
Cannon, H., 864.
Capó, B. G., 593.
Carbone, E., 386.
Card, L. E., 387.
Carleton, E. A., 311.
Carlile, J. A., 32.
Carlström, B., 668.
Carlyle, E. C., 98, 382.
Carman, P. C., 453.
Carmichael, J., 397.
Carneiro, V., 397.
Carns, W. A., 480.
Carolus, R. L., 59.
Carpenter, C. D., 678.
Carpenter, C. M., 822.
Carpenter, C. W., 505.
Carpenter, L. E., 126.
Carpenter, T. L., 364.
Carpenter, T. M., 700.
Carr, J. G., 820.
Carrick, C. W., 431.
Carrick, R., 44.
Carrigan, R. A., 581.
Carroll, W. E., 43, 381, 382.
Carruth, L. A., 659.
Carter, C. W., 385.
Carter, D. G., 22, 94, 113.
Carter, J., Jr., 619, 760.
Carter, J. C., 201.
Carter, R. C., 179.
Carter, W., 345.
Carter, W. B., 526.
Cartledge, J. L., 41.
Cartwright, O. L., 518.
Cartwright, W. B., 652, 770.
Carver, J. S., 229, 386.
Carver, W. A., 616.
Cary, C. A., 675.
Caryl, R. E., 630.
Case, A. A., 255.
Case, C. H., 397.
Case, H. C. M., 690, 691.
Cash, E. K., 647.
Casida, C. E., 179.
Casida, L. E., 42.
Caskey, C. D., 534, 811.
Cassady, J. T., 243, 682.
Cassell, R. C., 206.
Cassil, C. C., 661.
Castell, C. H., 537.
Castelló, S., 387.
Castle, W. E., 179, 608.
Cathcart, C. S., 193, 314.
Cathcart, S. L., 676.
Cathcart, W. H., 847.
Cattell, J., 753.
Caulfield, W. J., 242, 673.
Chadwick, F., Jr., 333.
Chadwick, L. C., 778.
Chadwick, T. C., 588.
Chaikoff, I. L., 390.
Chamberlain, E. E., 348.
Chamberlin, T. R., 516.
Chamberlin, T. W., 446.
Chamberlin, V. D., 97, 237, 387.
Chamberlin, W. J., 226.
Chambliss, C. E., 597.
Chance, F. S., 481, 529.
Chance, M. R. A., 285.
Chandler, A. C., 821.
Chandler, F. B., 335, 630, 631.
Chandler, J., 265.
Chandler, R. F., Jr., 200, 310, 763.
Chandler, S. C., 83, 516, 523, 662.
Chandler, W. L., 252.
Chang, M. S., 325.
Chang, S. C., 28, 313.
Chao-Lin, F., 25.
Chapin, W. E., 160.
Chapman, A. B., 42, 391.
Chapman, H. D., 63.
Chapman, P. J., 223, 367, 518.
Chardon, C. E., 596.
Chardón, F., 617.
Charipper, H. A., 757, 758.
Charles, T. B., 805, 823.
Charlton, J. L., 115.
Chatfield, C., 699.
Chatten, F., 523.
Chen, J. S., 329.
Chen, S. H., 224.
Cheney, H. B., 482.
Cheney, L. C., 13, 16, 586, 734.
Cheng, T. H., 86.
Chesley, F. F., 567.
Chester, K. S., 68, 74, 201, 207, 779, 781.
Chidester, M. S., 513.
Child, J. H., 198.
Childs, L., 795.
Chilton, St. J. P., 81, 378, 504, 638, 785.
Chiun, H., 569.
Chisman, H. H., 632.
Chitwood, B. G., 355, 649.
Chitwood, M. B., 346.
Chiu, S. F., 86.
Choate, H. A., 316.
Chopra, R. N., 396.
Christensen, C. L., 410.
Christensen, C. M., 81, 378, 513.
Christensen, F. W., 863.
Christensen, J. F., 248.
Christensen, J. J., 41, 503.
Christensen, R. P., 117, 552.
Christgau, R. J., 179.
Christiansen, R. M., 782.
Christie, J. R., 649.
Chu, J. P., 610.
Chucka, J. A., 533, 535
Church, G. L., 472
Churchill, B. R., 53, 95, 484, 487, 536.
Churchward, J. G., 639.
Clague, J. A., 843, 862.
Clancy, C. F., 791.
Clapham, P. A., 401, 685, 686.
Clapp, A. L., 51.
Clapp, H. S., 771.
Clapp, L. E., 549.
Clark, C. F., 767, 768.
Clark, C. M., 691.
Clark, F. J., 755.
Clark, J. A., 55, 503.
Clark, J. H., 197, 631.
Clark, N., 143, 430
Clark, O. R., 590.
Clark, R. B., 473.
Clarke, E. L., 236.
Clarke, E. S., 397.
Clarke, M. K., 823.
Claude, A., 820.
Clausen, E. M. L.-, 427.
Clausen, F. W., 46.
Clausen, N. M., 108.
Clausen, R. T., 169.
Clausen, S. W., 667.
Clavell, C. J., 617.
Clawson, A. B., 396.
Clawson, M., 258.
Claydon, T. J., 864.
Clayton, B. S., 687.
Clayton, C. N., 344, 789.
Clayton, E. E., 780, 782.
Clayton, H. H., 447.
Clayton, M. M., 410.
Clement, R. L., 649.
Clements, F. E., 32.
Clements, H. F., 479, 500, 621.

Clifcorn, L. E., 126.
Cline, D. C., 119.
Cline, J. A., 269.
Clore, W. J., 185, 190.
Clyde, A. W., 831.
Clyde, G. D., 304.
Coatney, G. R., 516.
Cobb, G. S., 649.
Cochran, H. L., 627.
Cockerill, P. W., 258.
Coco, R. M., 758.
Coddington, J. W., 407.
Coe, F. M., 412.
Coffey, W. C., 430.
Coggeshall, L. T., 821.
Cohn, E. T., 572.
Colby, A. S., 340, 495.
Colby, W. G., 759, 771.
Cole, C. A., 782.
Cole, C. L., 178, 380, 479.
Cole, H. H., 328, 477, 612, 758.
Cole, J. R., 510, 779, 781.
Cole, J. S., 622.
Cole, L. J., 475, 753.
Cole, W. C., 105.
Colebrook, L., 821.
Coleman, O. H., 189.
Coleman, R., 30.
Coles, J. V., 286, 861.
Coles, R., 98.
Collins, D. H., 683.
Collins, E. R., 594.
Collins, E. V., 50, 85, 113, 380.
Collip, J. B., 184.
Collison, R. C., 340, 775, 776.
Colman, W., 652.
Colom, J. L., 3, 5.
Colombian, M., 407.
Colon Torres, R., 689.
Colvin, E. M., 263, 834.
Colvin, W. S., 741.
Colwell, C. A., 467.
Combs, W. B., 102, 104, 536, 538.
Comfort, J. E., 229.
Common, R. H., 811.
Compton, J., 456, 605.
Comstock, R. E., 178.
Comstock, W. P., 222.
Conant, N. F., 467.
Conard, A., 170.
Cone, J. F., 538.
Conklin, J. G., 796.
Conn, H. J., 40.
Connelly, J. W., 250, 543.
Conner, A. B., 430.
Conrad, J. P., 312, 743.
Conrad, R. M., 388.
Conrat, H. L. F., 184.
Conrey, G. W., 160.
Constantinesco, G. K., 610.
Contardi, H. G., 474.
Converse, H. T., 391, 675.
Conway, V. M., 316.
Cooil, B. J., 488.
Cook, D. B., 790.
Cook, D. H., 666, 805, 806.
Cook, E. S., 470.
Cook, F. W., 401.
Cook, G. M., 843.
Cook, H. T., 212, 635.
Cook, J. W., 229, 386.
Cook, M. T., 432, 635.
Cook, R. L., 23, 489, 507.
Cook, W. C., 354.
Cook, W. H., 388.
Cooke, O. B., 651.
Cooley, J. S., 80.
Cooley, R. J., 672, 673.
Coombes, A. I., 95.
Coon, B. F., 368.
Coons, A. E., 575.
Coons, G. H., 346.
Cooper, D. C., 333, 604, 619.
Cooper, F. S., 457.
Cooper, H. P., 480, 574.
Cooper, J. M., 178.
Cooper, J. R., 56, 626.
Cooper, T. P., 431, 574.
Copeland, F. C., 755.
Copeland, L., 608, 756.
Copeland, O. C., 675.
Corbett, L. C., 576.
Corbett, R. B., 431.
Corbett, W. J., 393, 539, 673.
Cordes, W. A., 103.
Cormack, M. W., 641.
Corner, H. H., 397.
Corte, M. D., 859.
Cory, E. N., 373, 656, 801.
Cory, V. L., 753, 863.
Costa, D., 803.
Cott, H. B., 514.
Cottam, H. R., 432.
Cottam, W. P., 483.
Cotter, R. U., 640, 785.
Cotton, R. T., 377, 516.
Couch, J. F., 396.
Couch, J. N., 821.
Coulter, J. W., 835.
Coulter, R. W., 90.
Coulter, S. T., 102, 536, 538.
Covas, G., 497.
Cover, M. S., 805, 823.
Cowan, E. W., 745.
Coward, K. H., 297.
Cowart, F. E., 178.
Cowart, F. F., 431.
Cowart, R., 185, 452.
Cowden, T. K., 264.
Cowgill, G. R., 711.
Cowles, B., 616.
Cowles, M. L., 142.
Cowsert, W. C., 535, 666, 759, 805.
Cox, H. R., 107, 820.
Cox, J. A., 221, 657.
Cox, R. F., 384, 756.
Cox, T. R., 507.
Crafts, A. S., 599.
Craig, J. A., 699.
Craig, R., 83.
Craighead, F., 514.
Craighead, J., 514.
Craigie, J. H., 41, 350.
Cralley, E. M., 68, 641.
Crampton, E. W., 381, 383, 384, 385.
Crandall, B. S., 344.
Crandall, F. K., 58, 337.
Crandall, G. C., 237.
Crandall, L. A., Jr., 567.
Crandell, H. A., 227.
Crane, M. B., 596.
Cravens, W. W., 382.
Crawford, A. B., 247, 820, 823.
Crawford, J. G., 834.
Crawford, W. S., 265, 553, 841.
Creek, C. R., 835.
Creighton, H. B., 726.
Crew, F. A. E., 176, 180, 327.
Crews, S. K., 437.
Crile, G. W., 127, 128.
Crisler, O. S., 242.
Crofton, W. M., 394.
Cromer, C. O., 831.
Cron, L. E., 834.
Cronister, K., 286.
Crooks, D. M., 32.
Crosier, W. F., 207.
Cross, C. E., 759.
Crossmon, B. D., 719.
Crosthwait, S. L., 374.
Crowe, L. K., 672.
Crowell, I. H., 500.
Crowley, D. J., 185, 190, 217.
Crowley, N., 274.
Crown, R. M., 665.
Crozier, W. J., 180.
Cruess, W. V., 39, 270.
Cruickshank, E. M., 388.
Cruikshank, J. W., 343.
Cruz Monclova, H. E., 581.
Csonka, F. A., 9.
Culbert, J. R., 432, 778.
Culbertson, C. C., 96, 380.
Culbertson, J. T., 821.
Cullison, A. E., 529, 805.
Culton, T. G., 812.
Cumley, R. W., 76, 753.
Cummins, G. B., 204, 456, 636.
Cunningham, C. R., 774.
Cunningham, M. M., 130.
Cuocolo, R., 401.
Currence, T. M., 336.
Curtis, G. M., 239.
Curtis, L. C., 364.
Curtis, M. R., 611.
Curzon, E., 669.
Cushing, R. L., 768.
Cushman, R. A., 91, 227, 804.
Cutler, G. H., 765, 770.
Cutright, C. R., 366, 656.

Cutting, W. C., 331.
Cutuly, E., 330.
Cutuly, E. C., 330.
Cykler, J. F., 720.

Daane, A., 49.
Dack, G. M., 143, 823.
Dacy, G. H., 669.
Dadswell, H. E., 605.
Daft, F. S., 139.
Dahlberg, A. C., 672, 673, 674, 815.
Dahle, C. D., 816.
Dahms, R. G., 220, 656.
Daigh, F. C., 85.
Daines, R. H., 73, 214, 353.
Dale, C. N., 249.
Dalling, T., 247.
Da Luz, C. G., 510.
Dam, H., 285.
Dana, B. F., 201.
Daniel, G. E., 245.
Dann, F. P., 423.
Dann, W. J., 857.
Danneel, R., 475.
Darányi, J. v., 345, 819.
Darby, W. J., 573.
Darker, G. D., 347.
Darkis, F. R., 72, 506.
Darlow, A. E., 42.
Darrow, G. M., 197, 631.
Dastur, J. F., 358.
Daubenmire, R. F., 169.
Daugherty, M. M., 116.
Daum, K., 127.
Davenport, C. B., 270.
Davidson, D. M., Jr., 408.
Davidson, J. A., 98, 387, 388, 389.
Davidson, J. B., 22, 50, 118.
Davidson, J. M., 741.
Davidson, L. G., 301.
Davidson, R. W., 80.
Davidson, W. B., 243.
Davidson, W. M., 383.
Davis, B. H., 202.
Davis, C. C., 404.
Davis, C. H., 747.
Davis, C. L., 252.
Davis, D. J., 821.
Davis, F. E., 159.
Davis, G. E., 107, 108, 228, 244, 804, 820.
Davis, G. K., 97, 178.
Davis, H. A., 31, 805.
Davis, H. P., 178, 608, 614.
Davis, J. F., 764.
Davis, J. G., 241, 817.
Davis, J. S., 695, 834.
Davis, K. C., 689.
Davis, L. L., 484.
Davis, R. E., 438.
Davis, S. P., 756.
Davis, W. A., 806.
Davis, W. H., 518.
Davison, V. E., 80, 791.
Davisson, B. R., 241.
Dawsey, L. H., 794.
Dawson, J. R., 608, 675, 676.
Dawson, O. L., 836.
Dawson, R. F., 321.
Dawson, W. M., 234.
Day, E. E., 288.
Day, E. L., 831, 834.
Day, F. T., 183, 184, 612.
Day, P. L., 573.
Dean, H. L., 465.
Dean, H. T., 141.
Dean, L. A., 448, 488, 528.
Deane, D. D., 672.
Dearstyne, R. S., 380.
De Bach, P., 525.
deBeer, G. R., 184.
De Caro, L., 707.
Decker, C. W., 672, 673.
Decker, G. C., 85.
DeCoursey, J. D., 525.
DeEds, F., 426.
Deem, A. W., 545.
DeFrance, J. A., 333.
Degman, E. S., 492.
DeGroat, A., 821.
Dehn, W. M., 588.
Deighton, T., 811.
de Jesus, Z., 251.
de Langen, C. D., 425.
Delaplane, J. P., 399.
Delaune, E., 109.
DeLay, P. D., 685.
Delić, D., 701.
Della Corte, M., 859.
Della Valle, J. M., 240.
DeLong, H. H., 403.
DeLong, R. F., 6.
Del Regno, F., 713.
del Toro, E., Jr., 689.
del Toro, G., Jr., 739.
Delwiche, E. J., 333, 335, 344.
de Marchi, I., 641.
Demaree, J. B., 510.
Demarest, B., 728.
DeMonbreun, W. A., 821.
Dempsey, E. W., 47.
Dempsey, P. W., 771.
Dennhardt, L., 142.
Dennis, J., 587.
Dennis, R. W. G., 642.
Denny, F. E., 231, 455, 595.
Deobald, H. J., 95.
DeOme, K. B., 44, 253.
Deonier, C. C., 92, 224.
Deppermann, C. E., 738.
Derlogea, V., 610.
Dermen, H., 502.
Dersham, G. E., 757.
Descartes, S. L., 835.
Deschiens, R. E. A., 346.
de Soriano, A. M., 466.
de Sütő-Nagy, G., 613.
Deters, M. E., 93.
Detjen, L. R., 57.
DeTurk, E. E., 163, 167.
Deuber, C. G., 499.
DeVault, S. H., 407.
Devereux, R. E., 306.
Dexter, S. T., 483.
Diachun, S., 77.
Diamond, L. K., 243.
Dias, E., 821.
Díaz Pacheco, S., 689.
Dibble, C. B., 654.
Dice, L. R., 753, 754.
Dick, J. B., 781.
Dicke, F. F., 91.
Dicker, G. H. L., 222, 798.
Dickerson, G. E., 42, 391, 608.
Dickey, R. D., 341, 357, 624, 780.
Dickins, D., 142, 286, 287, 562, 861.
Dickson, A. D., 302, 333.
Dickson, J. G., 333, 344.
Diddens, H. A., 467.
Diehl, H. C., 190.
Dieter, C. E., 87, 364, 516.
Dietz, S. M., 745.
Digby, M., 407.
Diller, O. D., 65.
Dimock, A. W., 344, 782.
Dimock, W. W., 251, 399, 815.
Dines, F. T., 295, 486.
Dinger, C. C., 306.
Ditman, L. P., 363, 371, 656.
Dju, M. Y., 426, 704.
Doak, G. O., 822.
Doan, C. A., 243.
Dobbs, C. G., 346.
Dobson, G. C., 741.
Dobzhansky, T., 754.
Dodge, B. O., 466, 513, 648.
Dodge, C. W., 468.
Dodge, H. H., 719.
Doehlert, C. A., 196, 379.
Doisy, E. A., 13, 15, 16, 45, 586, 733, 734, 737, 857.
Dols, M. J. L., 386.
Domagk, G., 821.
Dominick, C. B., 661.
Donahue, R. L., 497.
Donaldson, F. T., 233, 771.
Donaldson, R. W., 759.
Doneth, J. C., 117.
Donisthorpe, H., 379.
Donnelly, M. W., 173.
Donoho, H., 720.
Donohoe, H. C., 526.
Doolittle, S. P., 71.
Doran, W. L., 783, 862.
Dorman, C., 30, 48, 143, 740.
Dornbush, A. C., 95.
Dorsey, M. J., 57, 339.
Doster-Virtue, M. E., 667
Doten, S. B., 574.
Doughty, J. L., 37.
Douglas, C. K. M., 158.
Douglass, A. E., 740.
Douglass, J. R., 354.
Dounce, A. L., 297.

Dounine, M. S., 784.
Dove, W. F., 410, 411.
Dow, G. F., 405.
Down, E. E., 53.
Downey, H., 243.
Downham, K. D., 401.
Downs, P. A., 539, 673.
Dowson, W. J., 353.
Doyle, L. P., 400, 546, 678.
Dragstedt, L. R., 823.
*Drain, B. D., 481, 489.*
Drake, C. J., 85, 797.
Drayton, F. L., 468.
Drechsler, C., 71, 649.
Dreibelbis, F. R., 741.
Drews, E. A., 88.
Drigalski, W. v., 716.
Driggers, B. F., 371.
Dropkin, D., 305.
Drosdoff, M., 451.
Dua, A. N., 307.
Dubnoff, J. W., 667.
Du Bois, C. W., 701, 862.
Dubois, K. P., 531.
Dubos, R. J., 607.
Dudley, J. E., Jr., 364.
Duff, V. B., 667.
Duffee, F. W., 42, 95, 114, 333, 382.
Duffendack, O. S., 437.
Duffield, J. W., 464.
Dufrenoy, J., 346.
Duggan, I. W., 405.
Duggar, B. M., 333, 344, 468.
Duley, F. L., 29.
*Dumont, R., 703.*
Dunbar, D., 126.
Dunbar, J., 567.
Dunbar, R. E., 588.
*Duncan, C. W., 239, 382, 675.*
Duncan, I. J., 339.
Duncan, O. D., 406, 696.
Duncan, R. E., 606.
Dunegan, J. C., 68.
Dungan, G. H., 656.
Dunham, W. E., 803.
Dunin, M. S., 784.
Dunkelberg, G. H., 548, 769.
Dunker, C. F., 843.
Dunkle, E. C., 432.
Dunklee, D. E., 744.
Dunlap, A. A., 635.
Dunlavy, H. E., 188.
Dunlop, G., 234, 681.
Dunmore, F. W., 18.
Dunn, L. C., 180.
Dunn, L. E., 160.
Dunn, M. S., 297.
Dunn, S., 32, 760, 783.
Dunning, W. F., 611.
*Duran-Reynals, F., 820.*
Durant, A. J., 242, 685.
Durfee, T., 615.
Durgin, R. C., 805, 823.
*Durrell, L. W., 243.*
Dustman, R. B., 339.
Dutcher, R. A., 670.
Dutky, S. R., 375.
du Toit, P. J., 425.
Duyfjes, H. G. P., 204.
Dwyer, C. M., 172.
Dyal, R. S., 25.
Dye, W. B., 303.
Dyer, R. E., 107, 820.
Dyer, W. J., 452, 455.
Dykstra, T. P., 786.
*Dykstra, W. W., 517.*
Dyme, H. C., 131.

Eagle, H., 243, 822.
Eagleson, C., 521.
Eargle, D. H., 593.
East, E. M., 595.
Easter, S. S., 663.
Eastman, M. G., 863.
Eaton, A. G., 706.
Eaton, C. B., 216.
Eaton, F. M., 172, 314.
Eaton, M. D., 541.
Eaton, S. V., 205.
Ebeling, W., 88, 524.
Ebling, W. H., 115, 117.
Eby, L. K., 687.
Eckert, G. W., 453.
Eckert, J. E., 94.
Eckhardt, R. C., 50, 68, 755.
Eckhardt, R. E., 713.
*Eddins, A. H., 77, 634, 782.*
Eddy, C. W., 150.
Eden, A., 243, 681.
Edgar, S. A., 821.
*Edgecombe, S. W., 197, 491.*
Edgerton, J. S., 290.
Edman, G. J., 104, 672.
Edmond, J. B., 439, 548, 769.
Edmondson, J. E., 674.
Edmunds, C. E., 387.
Edmundson, W. C., 334, 353.
Edson, H. A., 201.
Edwards, E. T., 352.
Edwards, F. R., 381.
Edwards, J., 183.
Edwards, J. K., 457.
Edwards, P. R., 251, 547, 822.
Eekelen, M. van, 707.
Effern, J., 727.
Efferson, J. N., 259, 260.
Egehøj, J., 247.
Eggers, V., 171.
Eheart, M. S., 576.
Ehlers, J. H., 753.
Ehrlich, J., 647.
Eichhorn, A., 677.
Eichmann, R. D., 87, 217.
Eigenbrodt, H. J., 517.
Eigsti, O. J., 753.
*Eisenmenger, W. S., 740, 741, 759, 771, 783.*
Eke, P. A., 258.
Elden, C. A., 328.
Elder, C., 238, 242.
Eldredge, J. C., 50.
Elford, W. J., 467.
Elgueta Guerin, M., 5.
Eliason, E. J., 199.
Ellenberger, H. B., 667.
Ellenbogen, V., 685.
Ellenwood, C. W., 628, 835.
*Ellinger, G. F., 422.*
Elliott, C., 69, 787.
Elliott, R., 835.
Ellis, D. J., 605.
*Ellis, G., 301.*
Ellis, N. R., 381, 382, 587.
Ellis, R. W. B., 283.
Ellison, E. S., 589.
Elrod, J. B., 576.
El-Sadr, M. M., 280, 711.
Eltinge, E. T., 644.
Eltringham, H., 227.
Elvehjem, C. A., 95, 126, 133, 236, 276, 283, 382, 383, 386, 531, 533, 567, 667, 669, 703, 712, 713.
Elwell, J. A., 160.
Ely, F., 391, 674, 815.
Embree, N. D., 730.
Emerson, B. B., 612.
Emerson, G. A., 284, 669, 806.
Emerson, O. H., 284.
Emerson, R., 317.
Emerson, R. A., 176.
Emlen, J. T., Jr., 792.
*Emmel, M. W., 253, 677, 685.*
Emmens, C. W., 610.
Emmett, A. D., 667, 857.
Emmett, P. H., 7.
*Emsweller, S. L., 598, 627.*
Enderlin, G., 345.
Enders, J. F., 820.
Enders, R. K., 183.
Engel, R. W., 95, 126, 132, 390.
Engel, S., 181.
Engene, S. A., 689, 690.
England, C. W., 538.
Engle, B. Q., 817.
Engle, H. B., 601.
Englehorn, A. J., 22, 50.
Engler, K., 113.
English, H., 202.
English, J., Jr., 172.
English, L. L., 519, 794.
Enigk, K., 543.
Enlow, C. R., 760.
Entenman, C., 390.
Enzie, J. V., 365.
Eoff, J. R., Jr., 269.
Epple, W. F., 673.
Epps, E. A., 160.
Erb, J. H., 672, 673.
Erb, R. E., 608.
Ergle, D. R., 450.
Erickson, H. D., 828.
Erickson, L., 396.
Erikson, A., 120.
Erikson, A. L., 864.
Errington, P. L., 791.

Erwin, L. E., 334.
Esckilsen, L. W., 78.
Eslick, R. F., 720.
Espe, D., 674.
Esselen, W. B., Jr., 137, 813, 843, 847.
Essig, E. O., 83, 652.
Esty, J. R., 346.
Etchells, J. L., 436.
Etheridge, W. C., 185.
Ettesvold, W. L., 267, 553, 840.
Euler, B. von, 415.
Euler, H. von, 415, 714.
Evans, B. R., 178.
Evans, C. A., 791.
Evans, H. M., 10, 45, 184, 284, 616, 669, 758, 806.
Evans, J. A., 518.
Evans, J. P., 711.
Evans, J. S., 612.
Evans, R. E., 810.
Evans, R. J., 95, 335, 719.
Evans, W. L., 122.
Eveleth, D. F., 239.
Eveleth, M. W., 239.
Evenden, J. C., 526.
Everitt, E. L., 72.
Everly, R. T., 804.
Everson, L. E., 770.
Ewalt, H. P., 391.
Ewing, D. T., 736.
Ewing, H. E., 525.
Ewing, T. A., 381.
Eydrigevich, E. V., 609.
Eyer, J. R., 365.
Ezekial, W. N., 780, 781.
Ezell, B. D., 61, 445.

Fabian, F. W., 16, 17, 436, 818.
Fabriani, G., 699, 700.
Fabricius, N. E., 103.
Fahey, J. E., 216, 652.
Fahey, J. J., 151.
Failla, G., 456.
Fairbanks, B. W., 669.
Falconer, J. I., 116, 257, 406, 835.
Fall, H. C., 144.
Fallscheer, H., 190, 217, 367.
Fan, C. H., 571.
Fangauf, R., 388.
Farber, S., 571.
Fargo, J. M., 95, 382.
Farish, L. R., 287.
Farmer, C. J., 569.
Farr, W. K., 35.
Farrar, C. L., 364.
Farrar, J. L., 499.
Farrar, M. D., 517.
Farrar, R. R., 673, 674.
Farrell, K. T., 843.
Farrell, M. A., 432.
Farrior, J. W., 188.
Fassig, W. W., 85.
Fauber, H., 186.
Faulder, E. T., 677.
Faust, E. C., 218, 821.
Fawcett, K. I., 632.
Fawns, H. T., 715.
Feeney, E. E., 95.
Feiginson, N. I., 784.
Feilden, G. St. C., 625.
Fein, H. D., 850.
Fekete, E., 614.
Feldman, W. H., 398, 677.
Fellers, C. R., 346, 725, 813, 828, 843, 847, 862.
Fellton, H. L., 372.
Felt, E. P., 215, 223, 367, 662.
Fenne, S. B., 780.
Fenne, S. P., 782.
Fenwick, D. W., 395.
Ferguson, C. E., 165.
Ferguson, G. R., 90.
Ferguson, L. C., 42, 608.
Ferguson, W., 349.
Fergusson, S. P., 738.
Fernando, M., 211.
Fernholz, E., 14, 139, 736.
Ferreira, A. J., 822.
Ferrier, W. T., 551, 837.
Ferrin, E. F., 381.
Ferris, E. B., 67.
Feutz, F., 674.
Fevold, H. L., 45, 613.
Feytaud, J., 223.
Fieger, E. A., 165.
Field, H., Jr., 11, 132, 731, 853.
Fieser, L. F., 15, 299, 586, 587, 735.
Fieser, M., 15.
Fife, J. M., 351, 797.
Fife, L. C., 83.
Fifield, W. M., 616, 624, 630.
Fildes, P., 466, 468.
Fincher, M. G., 543.
Findlay, W. P. K., 362.
Fink, D. S., 309, 333.
Fink, K. C., 446.
Finkelstein, H., 251, 399.
Finn, M., 417.
Finne, I., 386.
Finney, K. F., 296.
Fiorini, P., 386.
Firesah, A. M., 157.
Fischer, G. W., 68, 73, 202, 471.
Fischer, R. C., 114, 382.
Fisher, D. F., 137, 487, 510.
Fisher, D. V., 494.
Fisher, E. D., 7.
Fisher, R. C., 795.
Fisk, D., 156.
Fisk, F. W., 652.
Fiske, J. G., 189.
Fiske, V. M., 45.
Fissmer, E., 669.
Fister, L. A., 481, 489.
Fitch, C. P., 106, 243, 675, 677, 823.
Fitts, J. W., 31.
Fitzgerald, F. M., 118, 557.
Fitzgerald, G. A., 346, 388.
Flach, E., 19.
Flagg, C. O., 432.
Flanders, S. E., 83, 222, 524, 801.
Flatt, C. A., 387.
Fleming, A., 822.
Fleming, C. E., 118, 481, 529, 540.
Fleming, W. E., 374.
Fleming, W. M., 193.
Fletcher, E. H., 590, 739.
Fletcher, H., 142.
Fletcher, R. K., 656.
Flint, O. S., 823.
Flint, W. P., 338, 516, 652, 656.
Flohn, H., 19.
Flior, H. H., 783, 785.
Fluke, C. L., 364, 516.
Folger, A. H., 532.
Folk, G. E., Jr., 615.
Folley, S. J., 46, 100, 613.
Follis, R. H., Jr., 824.
Folsom, D., 208, 344.
Folsom, T. R., 456.
Foltz, V. D., 394.
Fontaine, F. E., 456.
Fontes, A., 466.
Foord, D. C., 539.
Forbes, E. B., 669, 807.
Ford, M., 40.
Forgeot, P., 823.
Forkner, C. E., 243.
Forman, L. W., 50.
Forsee, W. T., Jr., 592, 616, 624.
Forshaw, R., 381, 383.
Fortuyn, A. B. D., 327.
Foster, E. M., 100, 673.
Foster, E. O., 233, 744.
Foster, F. I., 47.
Foster, J. W., 467.
Foster, J. Y., 719.
Foter, M. J., 151.
Fothergill, L. D., 819.
Foulkrod, G. M., 805.
Fourie, J. M., 826.
Fournelle, H. J., 673.
Fouts, E. L., 104, 393, 431, 537, 539.
Fouts, P. J., 385.
Fowler, M. E., 215.
Fowler, R. L., 504.
Fowler, W. F., Jr., 466.
Fox, H., 219.
Fox, I., 225.
Fox, W. K., 539.
Fraenkel, M., 330.
Fraenkel-Conrat, H. L., 184.

Frame, B. H., 257.
*Frampton, V. L., 346, 643.*
Franceschini, J., 707.
Francis, E., 823.
Francis, F. C., 719.
Francis, G. M., 695.
Francis, W. D., 315.
Françon, J., 227.
Frandsen, J. H., 673, 703, 814.
Frank, A. H., 247.
Frank, E. R., 542.
Frank, L. W., 424.
Franke, K. W., 599.
Franklin, H. J., 796, 828.
Franklin, H. L., 120, 263.
Franklin, J. A., 719.
Fransen, J. J., 215.
Fraps, G. S., 22, 98, 232, 275, 300, 382, 390, 743.
Frayer, J. M., 816.
Frayser, M. E., 574.
Frazier, W. A., 490.
Frazier, W. C., 6, 100, 126, 673.
Frear, D. E. H., 584.
Frederick, L. D., 678.
Frediani, H. A., 581.
Freeman, A. E., Jr., 254.
Freeman, E. M., 719.
Freeman, M. E., 843.
Freeman, O. W., 699.
Freeman, V. A., 97.
Freemyer, G. W., 839.
French, A. P., 771.
French, B. J., 805.
French, C. E., 807.
French, C. L., 436.
French, G. T., 226.
*French, R. B., 699.*
Frenkel, H. S., 820.
Freudenberger, C. B., 46.
Frey, C. N., 417, 444, 468.
Frick, L. P., 821.
Fried, L. A., 791.
Friedman, G. J., 569.
Friend, R. B., 218, 651, 864.
Friend, W. H., 358.
*Frisbie, W. S., 412.*
Froker, R. K., 117.
Frolik, A. L., 186.
*Frolik, E. F., 483.*
Frolova, M. I., 362.
Fromme, F. D., 862.
*Frost, D. V., 126.*
Frost, O. M., 688.
Fry, E. M., 15, 299, 586, 735.
Fudge, B. R., 634.
Fudge, J. F., 22, 232, 275, 300, 743.
Fuelleman, R. F., 763.
Fuhr, I., 126.
Fukunaga, E. T., 448, 488.
Fullaway, D. T., 218.
Fuller, A. T., 821.
Fuller, J. E., 843.
Fuller, J. G., 380.
Fulmer, H. L., 408.
*Fulton, R. A., 18, 83.*
Funk, E. M., 99, 229, 388.
Furr, J. R., 495.
Furth, J., 243, 820.
Futrall, J. C., 268.

Gabbard, J. L., 456.
Gabriel, H. S., 116.
Gadd, C. H., 648.
Gaddum, L. W., 450, 581.
Gaessler, W. G., 6, 50.
Gafford, J. A., Jr., 820.
Gaffron, H., 467, 602, 752.
Gahan, A. B., 804.
Gahley, H. G., 229.
Gaines, E. F., 185, 202.
Gaines, W. L., 392, 539.
Gainey, P. L., 456.
Galbraith, J. K., 115.
Gall, O. E., 450.
Galloway, H. M., 310.
Galpin, N., 609.
Gambrell, F. L., 376.
Gant, O. K., 416.
Garcia, F., 143.
Gard, S., 822.
Gardner, J., 126.
Gardner, K. E., 719.
Gardner, M. W., 782.
Gardner, W., 430.
Gardner, W. U., 44.
Garey, J. C., 673.
Garland, H., 288.
Garland, W., 796.
Garlick, G. G., 110, 397.
Garlick, W. G., 226, 524.
Garman, P., 517, 651, 652.
Garner, R. J., 625.
Garner, W. W., 54.
Garrard, E. H., 537.
*Garrett, O. F., 101, 240, 673.*
Garrett, S. D., 69.
Garrigus, U. S., 719.
*Garrigus, W. P., 381.*
Garrison, E. R., 238, 674.
Garrison, O. B., 488.
*Garside, J. S., 684.*
Garver, H. L., 256.
Gary, J. C., 100.
Gashwiler, J. S., 68.
Gassner, F. X., 249.
Gates, F. C., 168, 596.
*Gates, M. D., Jr., 15, 586, 735.*
Gauch, H., 173.
Gauger, H. C., 401.
Gäumann, E., 508.
Gause, G. F., 457.
Gaylord, F. C., 632.
Geddes, J. A., 559.
Geeslin, L. E., 714.
Gehenio, P. M., 458, 600.
Geiger, A., 298, 733, 735.
Genaux, C. M., 66.
Gentcheff, G., 595.
Gentner, L. G., 795.
George, J. J., 590.
*Georgi, C. D. V., 793, 794.*
Georgi, C. E., 456.
Gerdjikoff, I., 716.
Gerhardt, F., 61, 445.
Gerner, G., 176.
Getz, H. R., 417.
Giambelli, C. A., 701.
Gibbs, J. B., 406, 555, 836.
Gibson, A. L., 526.
Gibson, C. S., 152.
Gibson, K. E., 217.
Gilbert, C. H., 803.
Gilbert, N. W., 765.
Gilbertson, G. I., 801.
Gildehaus, E. J., 189.
Gildow, E. M., 178, 547.
Gile, P. L., 166.
Gilgut, C. J., 359, 771, 783.
Gillam, W. S., 452.
Gillespie, J. H., 864.
Gillett, J. A., 354.
Gillette, J. M., 124.
Gilligan, G. M., 22, 48.
*Gilman, J. C., 348.*
Giltner, L. T., 541, 677, 826.
Gini, E., 471.
Ginsburg, J. M., 366, 520, 653.
Gish, C. L., 389.
Gjessing, E. C., 816.
Glaser, R. W., 395, 800, 821.
Glasgow, H., 364, 516.
Glass, E. H., 576, 661.
Glasscock, H. H., 212.
Gleissner, B. D., 432.
*Glick, D. P., 208.*
Glickstein, M., 673, 814.
Glindeman, P. M., 126.
Glover, A. J., 391.
Glover, D. W., 674.
Glover, L. C., 796.
Glover, R. E., 247.
Gloyd, H. K., 516.
Gloyer, W. O., 191, 626.
*Gnadinger, C. B., 90.*
Godbey, E. G., 529.
Goddard, D. R., 467, 601.
*Godden, W., 129.*
Godfrey, G. H., 358, 635, 780, 782, 790.
Goering, K. J., 771.
Goettsch, E., 128.
Goettsch, M., 382.
*Goetz, A., 456.*
Goldfaden, M. F., 668.
Goldhamer, S. M., 413.
Goldie, W., 683.
Goldin, M. I., 511.
Golding, F. D., 219.
Golding, N. S., 238.
Goldsmith, G. A., 422, 569.
Goldsmith, G. W., 76, 780, 781.
Goldstein, F., 113.
Goldston, E. F., 306.
Golick, A. M., 151.
Gomez, E. T., 182, 608.

Gómez, L. A., 625.
Gonzaga, A. C., 233.
Gonzales, S. S., 526.
Gonzalez, J. O., 682.
Gonzalez, L. G., 720.
González, L. M., 822.
Goo, G. W. H., 825.
Good, E. S., 381.
Goodale, H. D., 178.
Goodearl, G. P., 99, 236.
Goodey, J. B., 69.
Goodhart, R. S., 419, 420.
Goodhue, L. D., 86, 372.
Goodman, G. J., 745.
Goodpasture, E. W., 819.
Goodsell, O. E., 554.
Goodsell, W. D., 552.
Goodspeed, T. H., 468.
Goodwin, M. W., 6, 85, 94.
Goodwin, R. H., 601.
Gordon, E. D., 829.
Gordon, G. E., 391.
Gordon, R. E., 752.
Gordon, R. F., 684.
Gordon, W. E., 464.
Gordon, W. S., 399, 681, 820, 823.
Gore, U. R., 187.
Goresline, H. E., 436, 468.
Gorini, C., 467.
Gorlenko, M., 784.
Gorman, E. A., Jr., 774.
Gorman, J. A., 236.
Gorter, F. J., 416.
Gortner, R. A., Jr., 706.
Goss, E. F., 103.
Goss, H., 44, 328, 612, 668, 758.
Goss, L. J., 112, 395.
Goss, R. W., 75, 77.
Gough, H. C., 797.
Gould, B. S., 467.
Gould, C. J., Jr., 745.
Gould, H. P., 630.
Gould, I. A., 539, 540.
Gould, S. P., 394.
Gowe, D. F., 569.
Gower, W. C., 401.
Goyco, J., 666.
Graber, L. F., 55, 144.
Grace, N. H., 199, 750.
Graf, G. O., 674.
Graham, C., 656.
Graham, E. R., 159, 165, 308.
Graham, F. J., 117.
Graham, G. L., 821.
Graham, R., 679, 680, 827.
Graham, S. A., 657.
Graham, W. R., 182, 238.
Grainger, J., 316, 628.
Graner, E. A., 473.
Granett, P., 669.
Granovsky, A. A., 516.
Grant, F. M., 538.
Gras, N. S. B., 559.
Gratia, A., 345, 819, 822.
Gratz, L. O., 500, 665.
Graves, R. R., 238, 536, 608, 674, 675, 676, 815.
Gray, C., 126.
Gray, E., 112.
Gray, E. L., 729.
Gray, J., 381.
Gray, K. W., 88.
Gray, L. C., 404.
Gray, R. E., 387.
Grayson, J. M., 380.
Greathouse, G. A., 203, 502.
Greaves, J. E., 273, 770.
Greaves, R. E., 401.
Greaves, V. D., 668.
Grechushnikov, A. I., 507, 598.
Green, F. M., 338.
Green, H. H., 243.
Green, L., 317.
Green, R. G., 252, 546, 791.
Green, W. W., 178.
Greene, H. S. N., 476.
Greene, J., 462.
Greene, P. S., 430.
Greene, R. D., 730.
Greene, R. R., 46, 331, 477, 478, 614, 758.
Greener, A. W., 107.
Greenlaw, J. P., 267, 842.
Greenlie, D. G., 301.
Greenman, J. M., 596.
Greenslade, R. M., 519.
Greenwood, A. W., 609.
Greenwood, D. A., 382.
Gregory, P. H., 468.
Gregory, P. W., 44, 542, 826.
Greig, J. R., 682.
Gresson, R. A. R., 758.
Greve, E. W., 57, 195.
Grey, C. G., 542.
Gridgeman, N. T., 571.
Griem, W. B., 126.
Griffee, F., 430, 693.
Griffin, D. R., 215.
Griffin, E., 416.
Griffin, H. V., 382.
Griffith, W. H., 845.
Griffiths, H. J., 522.
Griggs, A. L., 740.
Grimes, W. E., 404.
Grini, O., 388.
Griswold, R. M., 381, 387, 388, 560.
Groome, J. R., 476.
Groshong, C., 126.
Gross, A. E., 782.
Gross, G. C., 575.
Gross, I. H., 429.
Gross, P. M., 72, 506.
Grottodden, O., 560.
Grove, E. W., 692.
Grove, L. C., 496.
Groves, K., 190, 217, 367, 684.
Gruenhagen, R., 844.
Grunder, M. S., 185, 217.
Grüneberg, H., 176, 179, 181, 184.
Guba, E. F., 509, 783.
Guérin, M., 820.
Guerin, M. E., 5.
Guerrant, N. B., 99, 670.
Guerrant, R. E., 229, 667.
Guest, P. L., 500.
Guhr, G., 280.
Guilbert, H. R., 582.
Guill, J. H., Jr., 371.
Guilliermond, A., 39, 596.
Guin, M., 148, 262, 688.
Guinn, C., 575.
Guiscafrè Arrillaga, J., 625.
Gullickson, T. W., 238, 675.
Gumbreck, L. G., 330.
Gunness, C. I., 159, 828.
Gunnison, J. B., 817.
Gunns, C. A., 386.
Gustafson, F. G., 455.
Gustafsson, A., 595.
Guthrie, E. S., 240, 673.
Guthrie, J. D., 86.
Guthrie, W. J., 399.
Gutman, A. B., 845.
Guyton, F. E., 363.
Gwin, J. M., 387.
György, P., 568, 713.

Haag, H. M., 257, 259, 266.
Haag, J. R., 667, 669.
Haagen, E., 345, 819.
Haagen-Smith, A. J., 172.
Haas, A. R. C., 62, 453.
Haasis, F. W., 352.
Haber, E. S., 6, 58, 191.
Habermann, R. T., 397, 545.
Hackedorn, H., 229, 381.
Haddock, D., 689.
Haddon, C. B., 187.
Haden, R. L., 243.
Hadley, C. H., 218.
Hadley, P., 466.
Hadro, G. J., 668, 843.
Haegele, R. W., 144.
Haenseler, C. M., 201.
Haeussler, G. J., 90.
Hafenrichter, A. L., 618.
Hafez, M., 517, 525, 526, 527
Hagan, W. A., 394, 822.
Hahn, A. J., 673.
Hahn, G. G., 215.
Haig, C., 564, 849.
Haigh, L. D., 745.
Haines, R. B., 467.
Hale, E. B., 382.
Hale, R. F., 115.
Hale, W. S., 441.
Hall, E. E., 480, 501.
Hall, E. R., 340.
Hall, G. O., 388.
Hall, H. H., 155, 166.
Hall, K., 477.
Hall, N. S., 159.

Hall, O. J., 115, 142.
Hall, S. R., 586.
Hall, W. C., 672.
Haller, H. L., 374.
Hallock, W. D., 270.
Halnan, E. T., 386.
Halpin, J. G., 95, 382, 386, 390.
Halverson, J. O., 531, 585.
Ham, W. T., 124.
Hambleton, E. J., 368, 372.
*Hamblin, I. E.*, 48, 617.
Hamburger, V., 182.
Hamer, W. J., 299.
Hamerstrom, F. N., Jr., 82, 514.
Hamilton, C. C., 369, 660.
Hamilton, C. H., 406, 575.
Hamilton, C. M., 253.
Hamilton, D. W., 659.
Hamilton, E., 556.
Hamilton, H. G., 121.
Hamilton, J. B., 46.
Hamilton, J. M., 784.
Hamilton, P. C., 804.
Hamilton, W. J., Jr., 514, 790, 791.
Hammarlund, C. T. W., 346.
Hammer, B. W., 103, 104, 674, 819.
Hammerberg, D. O., 405.
Hammersland, H. L., 246.
Hammond, G. H., 801.
Hamner, A. L., 223, 798.
*Hamner, C. L.*, 174.
Hamner, K. C., 175, 455.
Hamre, C. J., 562.
Hancin, J., 168.
Hancock, N. I., 481, 621.
Hand, D. B., 176, 240.
Hand, I. F., 590.
Hankins, O. G., 381.
Hankinson, C. L., 674.
Hanks, J. H., 468.
Hanmer, H. R., 486.
Hanna, G. C., 191, 626.
Hannah, H. W., 554, 884.
Hansard, S. L., 675.
Hansberry, R., 83, 86, 653.
Hansen, A., 752.
Hansen, D., 567.
Hansen, E., 61, 64.
Hansen, E. T., 285.
Hansen, H. N., 80, 203.
Hansen, H. P., 324.
Hansen, N. E., 774.
Hansen, T. S., 499.
Hanson, E. W., 503.
Hanson, H. S., 226.
Hanson, W. R., 763.
Happ, S. C., 741.
Happold, F. C., 467.
Haralson, F. E., 338.
Hardell, R. E., 674.
Hardenburg, E. V., 766.
Harder, R., 468.
Hardin, L. J., 594.
Harding, P. L., 137.
Hardman, G., 548.
Hardy, E. L., 590.
Hardy, J. I., 141, 573.
Hardy, M. B., 745, 780.
Hare, J. F., 642.
Harford, C. G., 394.
Haring, C. M., 251.
Harlan, C. L., 115.
Harlan, H. V., 470.
*Harley, C. P.*, 629.
Harley, J. L., 604.
Harlow, W. M., 466.
Harman, M. T., 329.
Harman, S. W., 370, 517, 518.
Harmon, F. N., 776, 777.
Harms, A., 388.
Harmston, F. C., 652, 799.
Harold, B. A., 860.
Harper, F. A., 840.
Harper, H. J., 300, 307.
Harr, J. F., 112.
Harradine, E. F., 162.
Harre, W., 669.
Harrell, D. C., 745, 781.
Harrell, F. M., 480.
Harrelson, R. T., 131.
Harrer, C. J., 855.
Harries, F. H., 522.
Harrington, C. D., 364, 523.
Harrington, F. L., 294.
Harrington, F. M., 167.
Harrington, H. D., 169.
*Harris, C. S.*, 217.
Harris, E. E., 737.
Harris, G. H., 197.
Harris, H. A., 787.
Harris, H. C., 22.
Harris, K. W., 430.
Harris, L. J., 277, 851.
Harris, M., 860.
Harris, P. L., 136.
Harris, R. H., 55, 443, 581, 582, 702.
Harrison, A. L., 782.
Harrison, C. M., 101.
Harrison, D. C., 426.
Harrison, T. B., 673.
Harsch, E. M., 178.
Harshbarger, K. E., 675.
Harshfield, G. S., 248, 255.
Hart, E. B., 95, 126, 386, 391, 531, 533, 567, 667.
Härtel, O., 447.
Hartman, G. H., 673.
Hartman, H., 64.
Hartman, J. D., 58, 61, 308.
Hartman, R. P., 240.
Hartnack, H., 363.
Hartt, C. E., 603.
Hartung, M. E., 488.
Hartzell, A., 363, 521, 526, 527.
Hartzell, F. Z., 217, 219, 367.
Hartzler, E. R., 131.
Harvey, A. L., 380.
Harvey, E. N., 467.
Harvey, L. H., 753.
Harvey, P. H., 188.
Harvey, R. B., 396, 460.
Harvey, W. A., 185.
Harwood, L. M., 381.
Harwood, P. D., 250, 397, 399.
Haseman, L., 90, 217, 798.
Haskell, R. J., 207, 780.
Haskins, C. P., 457.
Haskins, H. D., 168.
Haslam, R. J., 506.
Hassid, W. Z., 604.
Hastings, E. G., 538.
Hastings, W. H., 843.
Hatcher, H. M., 698.
Haterius, H. O., 757.
Hathaway, I. L., 614.
Hauck, C. W., 116.
Hauge, S. M., 675.
Haugh, R. R., 388.
Hausberger, F. X., 570.
Hausman, L. A., 650.
Havas, L. J., 346.
Haver, F. E., Jr., 456, 605.
Havis, A. L., 604.
Hawk, V. B., 160.
Hawkins, A., 333.
Hawkins, B. S., 480.
Hawkins, J., 344, 364.
Hawkins, L. A., 216.
Hawkins, L. E., 380.
*Hawkinson, J. R.*, 387.
Hawley, I. M., 660.
Hawthorn, L. R., 772.
Hay, D. G., 842.
Hay, W. D., 144.
Haydak, M. H., 378, 516, 798, 804.
Hayden, A., 596.
Hayden, C. E., 543.
Hayes, H. K., 49, 325.
Hayes, W. P., 516.
Haynes, J. L., 303.
Hays, F. A., 757.
Hays, M. B., 286.
Hays, O. E., 21, 306, 382.
Hayward, S. J., 477.
Hazen, M. W., 229.
Hazen, N. W., 263.
Hazlewood, B. P., 481, 535.
Headlee, T. J., 228, 364.
Headley, F. B., 481, 529, 536, 809.
Heald, F. D., 202, 636.
Heath, C. W., 243, 414.
Heath, L. M., 108.
Heathman, W. W., 608.
Hebert, T. T., 788.
Hechter, O., 330.
Hechtman, J., 585.
Hector, L. G., 395.
Hedden, O. K., 833.
Hedgcock, G. G., 783.

Hedlund, E. C., 381.
Hegarty, C. P., 607.
Heggeness, H. G., 500.
Hegsted, D. M., 126, 667.
Heidenthal, G., 180.
Heilborn, O., 492.
Heiman, V., 386.
Hein, M. A., 764.
Heinze, P. H., 153, 189.
Heisig, C., 117.
Heismann, P., 35.
Heiss, R., 701.
Heit, C. E., 199.
Heitz, T. W., 387.
Helgeson, E. A., 623.
Heller, C. G., 331.
Heller, V. G., 231, 235, 812.
Hellinga, J. J. A., 207.
Hellman, L. M., 424.
Helm, C. A., 185.
Helmer, O. M., 385.
Helser, M. D., 96.
Henderson, E. W., 386.
Henderson, H. B., 673.
Henderson, H. O., 674.
Henderson, J. L., 393, 539.
Henderson, J. R., 234, 592.
Henderson, M. D., 843.
Henderson, P. A., 690.
Hendrick, J., 793.
Hendricks, H. V., 318.
Hendricks, W. H., 677.
Hendrickson, G. O., 215.
Hendrickson, R. F., 404.
Hendrix, B. M., 587.
Henke, L. A., 382, 528, 808.
Hennefrund, H. E., 834.
Henning, W. L., 809.
Henry, B., 344.
Henry, D., 241.
Henry, K. M., 570.
Hensill, G. S., 86.
Hepler, J. R., 771.
Hepner, F. E., 446.
Herman, C. M., 395.
Herman, H. A., 178, 182, 238, 608, 759, 806.
Hermann, F. J., 596, 599.
Hermann, V. S., 712.
Hermann, W., 53, 185.
Herms, W. B., 665.
Hernández, G. R., 805, 806.
Hernández, M., 689.
Herreid, E. O., 674, 676.
Herrick, C. A., 105, 382.
Herrick, E. H., 332, 363.
Herrick, J. A., 636.
Herrin, R. C., 417, 565.
Herring, V., 238.
Herrmann, L. F., 839.
Herrmann, O. W., 839.
Hershey, A. L., 597.
Hertel, K. L., 481.
Hervey, G. E. R., 794.
Hess, A. D., 802.
Hesse, C. O., 60.
Hester, H. R., 827.
Hetherton, P., 699.
Hetrick, J. H., 673.
Hetrick, L. A., 662.
Hetzer, H. O., 381.
Heuberger, J. W., 784.
Heuser, G. F., 386, 668.
Hewston, E. M., 278.
Heyl, R. E., 673.
Heyne, E. G., 52.
Heywang, B. W., 533.
Hibbard, A. D., 189.
Hibbard, P. L., 31.
Hibbard, R. P., 438.
Hicks, E. A., 215.
Hienton, T. E., 524.
Hieser, L., 861.
Hiesey, W. M., 457.
Higgins, B. B., 783.
Higgins, E. R., 843.
Higgins, L. J., 760.
Higgs, A. J., 157.
Highfill, J. V., 864.
Highstone, H. A., 559.
Hilborn, M. T., 344.
Hildebrand, E. M., 356, 492.
Hildebrand, G. B., 417.
Hill, A. F., 595.
Hill, C. C., 92.
Hill, E. B., 835.
Hill, H., 508.
Hill, H. O., 575.
Hill, J. A., 574.
Hill, M., 405, 406.
Hill, R., 330.
Hill, S. O., 650.
Hillary, B. B., 465.
Hills, G. M., 852.
Hilston, N. W., 94.
Hilton, J. H., 608, 675.
Hincks, M. A., 693.
Hind, H. G., 280, 464.
Hiner, L. D., 575.
Hiner, R. L., 233.
Hines, L., 612.
Hinman, E. H., 525.
Hinman, E. J., 516.
Hinshaw, W. R., 112.
Hinton, S. A., 675.
Hirato, K., 105.
Hirsch, A. A., 157.
Hirsch, J., 468.
Hirst, C. T., 770.
Hisaw, F. L., 45.
Hitchcock, A. E., 750.
Hitchens, A. P., 466.
Hitchings, G. H., 848.
Hitt, H. L., 410.
Hitz, C. W., 60.
Hixon, R. M., 6, 50, 150, 296.
Hixson, H., 94.
Hoagland, D. R., 173, 319, 450, 456, 599.
Hoagland, R., 269, 845.
Hobson, A., 405.
Hockey, J. F., 522.
Hodes, H. L., 476.
Hodge, E. T., 699.
Hodge, H. C., 427.
Hodges, D. B., 305.
Hodgson, H. E., 238.
Hodgson, R. W., 64.
Hodson, A. C., 81, 378, 515, 516.
Hodson, A. Z., 151.
Hoener, I. R., 765.
Hoeppli, R., 821.
Hoerner, G. R., 71, 344, 491.
Hof, T., 467.
Hoffer, M., 280.
Hoffman, A. C., 405, 693.
Hoffman, G. R., 423.
Hoffman, M. B., 61, 629.
Hoffmann, C. H., 648.
Hofmann, F. W., 194.
Hogan, A. G., 229, 667.
Hogg, P., 333.
Hohl, L. H., 39.
Holcomb, E. J., 838.
Holcomb, W. F., 586, 734.
Holdaway, C. W., 233.
Holdaway, F. G., 517.
Hole, E., 555, 836.
Holl, F. J., 395.
Hollaender, A., 240, 467.
Holland, C. R., 685.
Holland, E. B., 725, 862.
Holland, E. O., 432.
Holland, G. P., 364.
Holland, R. F., 673.
Hollander, W. F., 475.
Hollembeak, H. D., 51.
Holley, K. T., 381.
Hollowell, E. A., 50.
Holly, O. M., 565, 566.
Holm, G. C., 546.
Holm, O. A., 842.
Holman, A. T., 690.
Holman, H. H., 250, 681.
Holmes, A. D., 282.
Holmes, C. E., 382.
Holmes, F. O., 345.
Holmes, H. N., 730, 854.
Holmin, N., 668.
Holt, A. L., 686.
Holt, E. G., 3, 5.
Holton, C. S., 202, 503.
Honey, E. E., 514.
Honeywell, E. R., 632.
Hontwedt, T., 685.
Hoog, E. G., Van't, 418.
Hoogerheide, J. C., 467.
Hoon, R. C., 306.
Hooton, D. R., 781.
Hoover, C. B., 405.
Hoover, S. R., 37, 322, 388.
Hopkins, F., 82.
Hopkins, J. A., 552, 559.
Hopkins, J. G., 821.
Hoppe, P. E., 500.
Hopperstead, S. L., 68, 85, 201.

Hora, F. B., 319.
Horlacher, L. J., 380.
Horlacher, W. R., 43, 94.
Horn, A., 387.
Hornberger, R. B., 672.
Hornburg, P. H., 335.
Horner, C. K., 468.
*Horner, G.*, 701.
Horner, G. M., 160.
Horrall, B. E., 673.
Horsfall, J. G., 784.
Horsfall, W. R., 84, 801.
Horvath, A. A., 6.
Horwood, R. E., 479.
Hosaka, E. Y., 479.
Hosi, S., 105.
Hoskins, W. M., 86.
Hotchkiss, N., 597.
Hou, H. C., 279.
Hou, K. C., 23.
Houchin, O. B., 44.
Hough, W. S., 218, 518.
Houghtaling, H. B., 315.
Houston, B. R., 500.
Houston, D. F., 576.
Hove, E., 95, 531.
Hoveland, N., 143, 430.
How, J. E., 323.
Howard, F. L., 173, 201, 317.
Howard, J. A., 603.
*Howard, N. F.*, 373.
Howell, C. E., 810.
Howitt, B. F., 819.
Howlett, F. S., 195, 510.
Howson, R. K., 537.
Hrenoff, A. K., 520.
Hubbs, C. L., 753.
Huber, G. A., 68, 190, 202, 217.
Huberman, M. A., 632.
Hubert, E. E., 69.
Huberty, M. R., 453.
Huddleson, I. F., 435, 678, 822.
Hudson, N. P., 819.
Hudson, R. S., 380.
Huelin, F. E., 494.
Huelsen, W. A., 627.
Huff, C. G., 41.
Huff, J., 688.
Huffman, C. F., 239, 382, 675.
Huffman, J. W., 329.
*Huffman, R. E.*, 407.
Hughes, E. H., 381, 542.
Hughes, G. C., 864.
Hughes, H. D., 22, 50.
Hughes, J. S., 456, 667.
Hughes, R. C., 650.
Hughes, W. L., Jr., 467.
Hulbert, H. H., 839.
Hulbert, W. C., 22, 113.
Hull, C., 2.
Hull, F. E., 684, 815.
Hull, F. H., 616.
Hülphers, G., 108.
Hultz, F. S., 381.
Hume, H. H., 289.
Humefeld, H., 428.
Hummel, B. L., 408.
Hummel, F. C., 282.
Hummel, K. P., 614.
Humphrey, E. N., 549.
Humphrey, G. D., 387.
Humphrey, L. M., 47, 68, 187.
Humphreys, M. E., 171.
Hunscher, H. A., 282.
Hunt, W. H., 397, 399, 545.
Hunter, B., 258.
Hunter, G. J. E., 102.
Hunziker, O. F., 102, 818.
Hurd, W. E., 157.
Hurd-Karrer, A. M., 72.
Hurlbut, H. S., 525.
Hurlbut, L. W., 550.
Hurst, V., 608.
Hurt, R. H., 242, 254.
Husmann, F. L., 62.
Husmann, G. C., 62.
Huston, J. M., 405.
Hutchings, S. S., 483.
Hutchins, A. E. 58, 191, 337, 474, 627.
Hutchins, L. M., 346.
Hutchinson, J. C. D., 811.
*Hutchison, H. E.*, 446.
Hutson, R., 515, 516, 524.
Hutt, F. B., 181, 609.
Huxley, J., 595.
Hwang, Y., 318.

Ibach, D. B., 834.
Ibsen, H. L., 756.
Igaravidez, L., 581.
Ikhtinajaya, T. A., 362.
Ingle, J. D., 673.
Innes, J. R. M., 234, 395, 681.
Insko, W. M., Jr., 388.
Irvine, O. R., 241.
Irwin, M. H., 270.
Irwin, M. R., 182, 608, 753.
Isaacs, R., 413.
*Isely, D.*, 84, 655.
Isenbeck, K., 346.
Ishizawa, T., 516.
Israelsen, O. W., 548.
Itabasi, K., 105.
Itie, G., 720.
Itihara, T., 678.
Itikawa, O., 678.
Ito, S. 105.
Ivanoff, S. S., 213.
Ivy, A. C., 46, 477.

Jaap, R. G., 610.
Jack, E. L., 393, 674.
Jackson, A. D., 863.
Jackson, H. C., 101.
Jackson, L. W. R., 81, 646.
Jackson, N. E., 559.
Jacob, H. E., 630
Jacobs, W. C., 157.
Jacot, A. P., 516.
Jacquot, H. D., 185.
Jagger, I. C., 355.
Jagodkina, V. N., 784.
James, D. F., 468.
James, L. H. 388.
*James, N.*, 468.
James, W. O., 34, 319.
Jameson, D. H., 744.
Jamieson, G. S., 150.
Jamison, F. S., 624.
Jamison, V. C., 161.
Jansen, B. C. P., 425.
Jantzon, H., 671.
Jardine, J. T., 862.
Jauch, C., 646.
Jefferies, J. H., 624.
Jeffrey, F. P., 390.
Jeffreys, F. J., 222.
Jeghers, H., 131.
Jehle, R. A., 201, 864.
Jellison, W. L., 216 516.
Jenkins, A. E., 346, 648.
Jenkins, J. M., Jr., 480, 501.
Jenkins, L., 217.
Jenkins, M. T., 50, 177.
Jenkins, R. R., 626.
Jenkins, W. A., 511, 781.
Jenkins, W. B., 405.
*Jenkins, W. H.*, 480, 745, 781.
Jenness, R., 674.
Jennison, M. W., 469.
Jenny, H., 6.
Jensen, E., 405, 693.
Jensen, H., 45.
Jensen, H. B., 707.
Jensen, H. W., 746.
Jensen, J. M., 102.
Jensen, O. G., 445.
Jensen, P. B., 597.
Jensen, R., 110.
Jensen, S. O., 468.
Jesness, O. B., 117, 834.
Jessen, R. J., 115.
Jessup, L. T., 402.
Jester, J. R., 498.
*Jeter, M. A.*, 864.
Jewett, H. H., 376.
Joachim, A. W. R., 700.
Joachimoglu, G., 425.
Jodon, N. E., 755.
Joessel, P.-H., 223.
*Joffe, J. S.*, 166.
Johansen, D. A., 464.
Johansson, E., 715.
Johansson, I. 43.
John, M. E., 841.
Johns, C. K., 537.
Johns, D. M., 187.
Johnson, A. C., 88, 227, 526.
Johnson, A. G., 635, 641.
Johnson, A. J., 180.
Johnson, B., 47.
Johnson, B. C., 95, 727, 815.
Johnson, D. W., 545.

Johnson, E. C. 287, 405, 432.
Johnson, E. M., 354, 635, 613, 790.
Johnson, E. P., 254, 547.
Johnson, F., 202.
Johnson F. H., 467.
Johnson, G., 117, 268, 843.
Johnson, G. E., 363.
Johnson, G. V., 652, 655.
Johnson, H. N., 820.
Johnson H. W., 76, 641.
Johnson, I. J., 764.
Johnson, J., 78, 333, 334 344, 345.
Johnson, J., Jr.. 582.
Johnson, J. J., 817.
Johnson, J. P., 651.
Johnson L. A., 756.
Johnson, L. E., 609.
Johnson, L. P. V., 18.
Johnson, L. R., 727.
Johnson, M. J., 6, 467.
Johnson, M. W., 332.
Johnson N. W.. 258, 553, 835.
Johnson, P. E., 675.
Johnson, S. R., 94. 229.
Johnson, T., 207, 326, 316, 504.
Johnson, T. G. 381.
Johnson, W. M., 308.
Johnston, A., 381.
Johnston, F. B., 508.
Johnston, H. R., 216.
Johnston, S., 776.
Johnstone F. E., Jr., 755.
Johnstone, P. H., 125.
Jolitz, C. E., 441.
Jolivette, J. P.. 335. 344.
Jolliffe, N., 850.
Jones, C. H., 667.
Jones, C. P., 725.
Jones, D. F., 324. 456.
Jones, E. E., 112.
Jones, G. D., 516.
Jones, G. H., 350. 638.
Jones, H. A., 191, 374, 511, 626, 772.
Jones, I. D., 436.
Jones, I. R., 391.
Jones, J. C., 675.
Jones, J. M., 381.
Jones J. R. J. L-, 364.
Jones, J. W., 484.
Jones, L. H., 72, 359, 771, 745.
Jones, L. K., 202, 514, 644, 649, 786.
Jones, M. M., 255, 256.
Jones, R. L., 529.
Jones, R. N., 15.
Jones, S. B., 677.
Jones, T. N., 548.
Jones, W. W., 488, 772.
Joneschild, E. M. 246.
Jordan, P., 467.
Jørgensen, A., 732.
Jornescu, C., 703.
Josephs, H. W., 564, 705.
Joshi, B. M., 494.
Joslyn, M. A., 154, 707.
Joss, A., 719.
Jugenheimer, R. W., 51.
Jukes, T. H., 383, 667 813.
Juliá, F., 617, 625, 635.
Jungeblut, C. W., 139.
Jungherr, E., 253 678, 791.
Junnila, W. A., 255, 719.
Jusatz, H. J., 717.

Kabat, E. A., 820.
Kachin, T., 497.
Kadow, K. J., 68, 85, 201.
Kahn, M. C., 466.
Kalkus, J. W., 287.
Kalmanson, G., 467.
Kalmbach, E. R., 792.
Kaloostian, G. H., 85.
Kamen, M. D. 604.
Kamm, O., 736.
Kammlade, W. G., 381.
Kämpe, Å., 685.
Kanazawa, K., 820.
Kandiah, S., 700.
Kane, E. A., 675.
Kantorowitsch, M., 430.
Kapel, F. J., 342.
Kaplan, N., 615.
Kapp, L. C., 22, 47.
Kara-Murza, L. (Kara-Mourza), 784.
Kardos, L. T., 160.
Kark, R., 285.
Karling, J. S., 468.
Karlson, A. G., 243, 398, 677.
Karmarkar, D. V., 494.
Karraker, P. E., 209.
Karrer, A. M. H.-, 72.
Karrer, P., 298, 728, 733, 734, 735.
Kassanis, B., 205.
Kater, J. McA., 315.
Kates, K. C., 398.
Katzman, P. A., 45.
Katznelson, H., 27, 28, 311.
Kauffmann, F., 395, 822.
Kaufman, L., 386.
Kay, H. D., 440.
Kearney, T. H. 484, 596.
Keeler, C. E., 179.
Keen, F. P., 499.
Keeping, E. S., 468.
Keeton, R. W., 137.
Keifer, H. H., 528.
Keim, F. D. 483.
Keith, T. B., 381, 667, 809.
Keitt, G. W., 344, 349, 856, 789.
Kelbert, D. G. A., 624 634, 644.
Keller, W. B., 501.
Kelley, A. P., 215.
Kelley, C. C., 449.
Kelley, M. A. R., 257.
Kelley, R. B., 183.
Kelley, W. P., 26.
Kelly, C. D., 156.
Kelly, C. F., 687.
Kelly, E. G., 217.
Kelly, J. P., 341, 456.
Kelly, P. L., 94, 674.
Kelser, R. A., 819.
Kelsey, F. E., 725.
Kelsheimer, E. G., 782.
Kemp, W. B., 288, 627.
Kempster, H. L., 99, 229, 389, 476.
Kendall, A. I., 467.
Kendrick, J. F., 239, 608.
KenKnight, G., 752.
Kennard, D. C.. 97, 237, 887.
Kennedy, S. R., Jr., 175.
Kenrick, G. W., 739.
Kenworthy, A. L., 190, 202.
Kenyon, A. S., 456.
Keogh, E. V., 819.
Kertesz, Z. I., 296, 302.
Kessel, J. F., 820.
Ketchersid, J. B., 396.
Keyock, N. L., 843.
Khan, A. A., 341.
Khudyna, I. P., 784.
Kidd, E. E., 387.
Kidd, J. G., 820.
Kidder, R. W., 616 665.
Kielley, W. W., 675.
Kienholz, R., 633.
Kiesselbach, T. A., 617, 622, 768.
Kightlinger, C. V., 783.
Kik, M. C., 127.
Kikuta, K., 500.
Killinger, G. B., 480.
Kimball, E. S., 405.
Kimble, M. S., 708.
Kime, P. H., 780, 782.
Kimmel, R. I., 405.
Kincaid, C. M., 381.
Kincaid, R. R., 78 616, 634, 780, 782.
King, A. J., 405.
King, B. M., 185, 188.
King, C. G., 135, 281, 855.
King, C. J., 642, 780, 781, 782.
King, H. H., 173, 174.
King, W. A., 95, 382, 675.
Kinnunen, E. J., 703.
Kiplinger, D. C., 198, 777.
Kirby, G. W., 468.
Kirby, R. S., 207, 214.
Kirk, P. L., 152.
Kirk, W. G., 381, 665.
Kirsch, W., 671.
Kirschbaum, A., 44.
Kirsner, J. B., 828.
Kiryanova, E. S., 362.
Kisliuk, M., Jr., 363.
Kisser, J., 502.
Kitaeva, O. N., 609.

Kite, G. D., 690.
Kittredge, J., Jr., 125.
Kjaer, A. S., 468.
Kleczkowska, J., 28.
Kleczkowski, A., 28.
Klein, J. R., 857, 858.
Klein, L. G., 198.
Kleinberg, W., 758.
Kleiner, I. S., 328.
Klemme, R. T., 406, 689.
Kligler, H., 821.
Kligler, I. J., 400, 820, 821.
Klose, A. A., 14, 585, 735, 736.
Klumpp, T. G., 412.
Kluyver, A. J., 466, 467.
Knandel, H. C., 388.
Knapp, B., Jr., 381.
Knapp, J. V., 396.
Kneen, E., 440.
Knight, C. A., 670.
Knight, C. A., Jr., 432.
Knight, K. L., 653.
Knipling, E. F., 244.
Knott, J. C., 238.
Knott, J. E., 338, 773.
Knowles, D., 560.
Knowlton, G. F., 83, 363, 652, 799.
Knox, R. G., 385.
Knudsen, L. F., 387.
Knutson, H., 797.
Kobayashi, K., 516.
Kobayashi, R., 820.
Köbe, K., 820.
Kober, S., 613.
Koch, F. C., 612.
Koch, L. W., 505, 506.
Kochakian, C. D., 758.
Kock, W. A., 387.
Koehler, A. E., 563.
Koehn, C. J., 668, 729.
Koen, J. S., 678.
Koffman, M., 686.
Köhler, E., 352.
Kohler, G. O., 95.
Kohn, H. I., 857, 858.
Kohnke, H., 741.
Koller, E. F., 102, 117.
Koller, F., 285.
Kolmer, J. A., 244.
Kolodny, L., 166, 313.
Kon, S. K., 570.
Korachevskii (Korachevsky), S. M., 784.
Konst, H., 41.
Koonz, C. H., 381.
Kopitke, J. C., 342, 633.
Kopland, D. V., 608, 675, 676.
Koppius, O. G., 437.
Korab, I. I., 362.
Korachevskii, (Korachevsky), I. K., 784.
Korenchevsky, V., 477.
Koróleva, N. I., 362.
Korzan, G. E., 575.
Kostoff, D., 346.
Kouba, T. J., 344.
Kövessi, F., 468.
Kozlova (Koslova), V. I., 784.
Kraebel, C. J., 29.
Krallinger, H. F., 327.
Kramer, M., 210.
Kramer, P. J., 316, 600.
Krassilnikov, N., 467.
Krauss, B. H., 322, 584.
Krauss, W. E., 95, 257, 382, 675.
Kraybill, H. R., 189.
Kreizinger, E. J., 185.
Krenke, N. P., 468.
Kreutzer, W. A., 787.
Krewson, C. F., 272, 283.
Krieger, C. H., 126.
Kringstad, H., 444, 667, 717, 732.
Krishnaswami, C. S., 211.
Kriss, M., 230, 231.
Krivin, B. G., 784.
Kroner, T. D., 575.
Kroulik, J. T., 456.
Krueger, A. P., 467.
Krumbhaar, E. B., 243.
Krumm, C. J., 342.
Krusekopf, H. H., 159, 160.
Kubin, R., 330.
Kucinski, K. J., 740, 741, 771, 783.
Kudo, R. R., 525.
Kuehn, C., 95.
Kuenzel, J. G., 66.
Kühnau, W. W., 714.
Kuitlow, K. W., 780.
Kumlien, W. F., 558, 696.
Kundu, B. C., 170.
Kung, L. C., 412.
Kunkel, L. O., 41, 205, 345, 456.
Kuntz, P. R., 617.
Kuprevich (Kuprewitch), V. F., 784.
Kurland, A. A., 330.
Küthe, F., 386.
Kuykendall, R., 185, 479, 617, 759.
Kuzell, W. C., 331.
Kusemeski, J. W., 862.
Kyzer, E. D., 480, 529, 548.

Lachman, W. H., 771.
Lacroix, D. S., 517.
LaCroix, R. V., 677.
Ladd, C. E., 288.
Ladejinsky, W., 120, 555.
Ladenheim, C., 665.
Ladewig, P., 820.
Lagasse, F. S., 57.
Lahr, E. L., 478.
Laird, D. G., 449.
Lakin, H. W., 166, 599.
Lal, M. B., 254.
Lalonde, L. M., 183.
Lamanna, C., 607.
LaMaster, J. P., 535, 540.
Lambert, W. V., 179.
Lambourne, J., 793, 794.
Lammerts, W. E., 205.
Lamoreux, W. F., 609.
LaMotte, R. S., 29.
Lampman, C. E., 547.
Landauer, W., 44, 475.
Landerkin, G. B., 533.
Landis, B. J., 373.
Landis, P. H., 698, 841.
Landon, R. H., 495.
Landsberg, H., 306, 739.
Landsberg, J. W., 396.
Lane, C. B., 104, 674.
Lane, M. C., 217.
Lanen, J. Van, 344.
Langdon, L. M., 466.
Lange, A., 387.
Lange, G., 834.
Lange, W. H., Jr., 90.
Langen, C. D. de, 425.
Langford, G. S., 373, 374.
Langford, M. H., 344, 349.
Langham, D. G., 42.
Langhus, W., 100.
Langley, B. C., 575.
Langsford, E. L., 693.
Lantz, E. M., 421, 422.
Lanzing, J. C., 297.
Lardy, H. A., 178, 615, 674, 807.
Large, J. R., 510, 781.
Larmour, R. K., 295.
Larsen, E. C., 8.
Larsen, H., 18.
Larsen, L. F., 829.
Larsen, P., 597.
Larson, A. H., 396.
Larson, A. L., 406, 689.
Larson, C. A., 185.
Larson, N. G., 834.
Larson, R. A., 394.
Larson, R. H., 333, 335, 344.
Larsson, A., 668.
Larsson, S. G., 507.
La Rue, R. G., 790.
Laskaris, T., 359.
Lasley, J. F., 178.
Lasocka, D., 855.
Lathrop, F. H., 363.
Latimer, H. B., 47.
Latimer, L. P., 771.
Latta, R., 89.
Laude, H. H., 52.
Lauffer, H., 101.
Lauffer, M. A., 210, 346.
Lauprecht, E., 386.
Laurie, A., 37, 198, 777, 778.
Laver, K. G., 198.
Law, L. W., 327, 614.
Lawrence, W. J. C., 324.
Lawson, C. A., 221.
Lea, A. J., 179.
Lea, D. E., 467.
Lea, G. F., 334.

Leach, C. N., 820.
Leach, J. G., 81, 352, 378.
Leach, L. D., 354.
Leake, C. D., 520.
Leamer, R. W., 452.
Lease, E. J., 439, 529, 535, 675, 806.
Leasure, E. E., 388.
Leathem, J. H., 45, 613.
Leather, J. H., 328.
LeBarron, R. K., 633.
Le Beau, F. J., 335, 344.
LeClerc, J. A., 153.
LeClerg, E. L., 767.
LeCompte, S. B., Jr., 454.
Lecuyer, R., 837.
Ledingham, G. A., 468.
Ledingham, J. C. G., 820.
Lee, A., 120, 432.
Lee, F. A., 626.
Lee, J. G., Jr., 289.
Lee, J. K., 575.
Lee, M. O., 814.
Lee, S. B., 469.
Lee, W. C., 437.
Leeder, J. G., 676.
Leeper, G. W., 28.
Lees, H., 571.
Leeuwen, E. R. Van, 367.
Lefebvre, C. L., 76, 641.
Leffert, I., 521.
Legler, R., 733.
Lehane, J. J., 446.
Lehman, F., 388.
Lehman, R. S., 217.
Lehman, S. G., 780, 781.
Leichsenring, J. M., 140.
Leighly, J., 663.
Leighty, J. A., 45.
Leinbach, F. H., 382.
Leith, B. D., 333.
Lemmer, N. N., 570.
Lemmon, P. E., 160.
Lengerken, H. von, 522.
Lennartson, R. W., 695.
Lenz, L. W., 783.
Leonard, A. O., 746.
Leonard, O. A., 641.
Leonard, V. B., 523.
Leonard, W. H., 186.
Leone, V., 859.
Leonian, L. H., 38, 468.
Leopold, A. S., 82, 83.
Lepard, O. L., 675.
Lepkovsky, S., 385.
Lerner, I. M., 475, 476.
Lerner, M. W., 615.
Leroux, P. L., 684.
Lesley, J. W., 474.
Leukel, R. W., 73, 365.
Leukel, W. A., 616.
Lev, M., 330.
Le Van, J. H., 652.
Leveck, H. H., 529.
Levin, C., 661.
Levine, A. S., 346, 725.
Levine, M., 70, 346.
Levine, M. N., 503.
Levine, P. P., 827.
Levowitz, D., 240.
Lewis, A. A., 179, 608.
Lewis, H. B., 706.
Lewis, H. C., 87.
Lewis, J. M., 564, 849.
Lewis, K. H., 469.
Lewis, L. F., 159.
Lewis, R. W., 598, 645.
Lewis, W. L., 382.
Li, C. H., 10, 184, 758.
Liebig, G. F., Jr., 26.
Lightfoot, C. C., 239.
Liik, E., 387.
Lilleland, O., 492.
Lillie, F. R., 331.
Lillie, R. D., 820.
Lilly, J. H., 364, 516, 655.
Lilly, V. G., 38, 468.
Liming, F. G., 200.
Lin, F. C., 25.
Lincoln, C. G., 663.
Lincoln, F. B., 491.
Lincoln, R. E., 144, 471, 502.
Lindegren, C. C., 468.
Lindegren, R. M., 361.
Lindner, R. C., 315.
Lindstrom, D. E., 842.
Lindstrom, E. W., 50, 68, 69.
Linford, M. B., 205, 649.
Ling, A. W., 96.
Ling, L., 209, 637.
Lininger, F. F., 432.
Link, C. B., 64.
Link, G. K. K., 171, 346.
Link, K. P., 105.
Link., R. P., 388.
Linke, F., 156.
Linsley, E. G., 662.
Linton, R. G., 530.
Lipman, C. B., 745.
*Lipman, J. G.*, 268.
Lipman, L. D., 674, 843.
Lipton, M. A., 531.
Lisbonne, M., 822.
Lisco, H., 96.
Litchfield, J. T., Jr., 822.
Litvinova, N. F., 362.
Live, I., 823.
Lively, C. E., 840.
Livermore, J. R., 755.
Livingston, B. E., 454.
Livingston, J. E., 201.
Livingstone, E. M., 83, 663.
Llewellyn-Jones, J. R. J., 364
Lloyd, E. A., 388.
Lloyd, J. W., 336.
Lobdell, R. N., 650.
Locke, A. P., 822.
Locke, S. B., 68, 344, 635.
Lockhart, C. H., 332.
Lockmiller, D. A., 559.
Lockwood, L. B., 467.
Lockwood, W. S., 256.
Loconti, J. D., 302.
Lodder, J., 467.
Loeb, L., 477.
Loghem, J. J. van, 466.
Lohman, M. L., 647.
Lombard, P. M., 768.
Long, H. F., 819.
Long, P. H., 822.
Long, T. E., 256.
Longenecker, H. E., 281.
Longley, B. J., 108.
Longrée, K., 360, 500.
*Loofbourow, J. R.*, 172.
Look, W. C., 517.
Loomis, C. P., 696.
Loomis, W. E., 50, 69.
Loos, C. A., 648.
Loosli, J. K., 382, 675.
López, A. R., 635.
Lord, R., 779.
Lorenz, A. J., 731.
Lorenz, F. W., 390.
Lorenz, O. A., 59.
Lorenz, R. W., 65.
Lorenzen, C., Jr., 740.
Lott, R. V., 339.
Lott, W. L., 166.
Loucks, K. W., 634.
Lough, S. A., 448.
Louis, L., 562.
Lounsky, J., 214.
Louw, A. J., 356.
Love, H. M., 576.
Love, J. E., 480, 548.
Lovell, M. E., 272.
Low, M., 845
Lowe, B., 131, 388.
Lowman, A., 8.
Lozner, E. L., 285.
Lu, G. D., 133.
Lubitz, J., 725.
Lucas, P. S., 394.
Lucchetti, E., 451.
Luce-Clausen, E. M., 427.
Luck, J. M., 745.
Ludwick, L. M., 674.
Ludwig, C. A., 37, 322.
Ludwig, F., 346.
Luebke, B. H., 265, 553.
Lund, A., 752.
Lunde, G., 444, 667, 717.
Lunn, W. M., 54.
Lush, J. L., 179.
Lutz, H., 63, 745, 780.
Lutz, J. F., 167, 452.
Luxen, M. P., 817.
Luyet, B. J., 458, 600.
Lyford, H. S., 245.
Lyle, C., 143, 193, 287, 520, 523, 525, 652, 718.
Lyle, E. W., 81.
Lyman, R. A., 479, 528.
Lynch, S. J., 624, 630.
Lyons, E. S., 31.
Lyons, W. R., 184, 758.
Lyssenko, T. D., 324.

Lythgoe, B., 280.

Maack, A. C., 241, 673.
MacAloney, H. J., 516.
*McArthur, W., 50.*
McAtee, W. L., 215, 793.
McAuliffe, H. D., 100, 675.
McBeth, C. W., 354.
McBride, C. B., 557.
McBride, C. G., 265, 835.
McBryde, C. N., 678.
McCall, M. A., 4.
McCall, R., 232.
McCalla, T. M., 29, 456.
McCallum, J. W., 399.
McCampbell, C. W., 384.
McCance, R. A., 414, 415.
McCarrison, R., 425.
McCarty, F. G., 219, 523.
McCarty R. G., 238.
McCauley, W. E., 516, 650.
McCay, C. M., 127, 530.
McClary, C. F., 236, 534.
Maclean, D. J., 305.
McClelland, C. K., 47, 53, 68, 637, 760, 768.
MacClement, W. D., 345.
McCluggage, M. E., 295.
McClung, L. S., 155.
McClure, F. J., 427.
McClure, J. T., 740.
McCollum, E. V., 10, 382.
McCollum, J. P., 336.
McComas, E. W., 233.
McComb, A. L., 342.
McCoord, A. B., 667.
McCord, J. S., 127.
MacCorquodale, D. W., 13, 15, 16, 586, 733, 734, 737, 857.
McCown, J. D., 480.
McCown, M., 776.
McCoy, E., 6.
McCoy, E. F., 466.
McCoy, O. R., 821.
MacCreary, D., 85.
McCrory, S. A., 659.
McCulloch, E. C., 109, 238, 242, 248, 254, 544, 684, 827.
McCulloch, L., 648.
McDaniel, E. I., 527.
McDaniel, L. E., 468.
MacDaniels, L. H., 492, 631, 774.
McDonald, C. W., 96.
MacDonald, G. B., 22.
McDonald, H. G., 229, 242.
McDonald, R., 850.
McDougall, E. J., 272.
McDougle, H. C., 242.
McDowell, C. H., 575.
McElroy, L. W., 668.
McElroy, O. E., 136.
McEwen, A. D., 105, 106, 678.
McFadden, E. S., 344.
McFarland, G. C., 673.
Macfie, J. M., 294.
McGeorge, W. T., 283, 744.
*MacGillivray, J. H., 337.*
McGlashan, H. D., 402.
McGoldrich, F., 767.
*McGovran, E. R., 661.*
McGregor, E. A., 228.
Machacek, J. E., 359.
Machlis, L., 500.
Machover, E., 126.
McIlvaine, H. R. C., 461.
McIntire, F. C., 344.
MacIntire, W. H., 448, 594.
McIntosh, J., 345, 819.
McIntosh, J. A., 719.
McIntyre, C. W., 185, 238, 674.
McIvor, B. C., 665.
Mack, G. L., 135.
Mack, M. J., 101, 539, 814, 819.
Mack, P. B., 859.
Mack, W., 255.
Mack, W. B., 773.
McKaig, N., Jr., 480.
McKay, E., 53.
McKay, F. S., 141.
McKee, C., 718.
McKee, R. W. 13, 586, 734, 737.
McKenna, G. F., 363, 526.
Mackenzie., C. G., 382.
McKenzie, F. F., 178, 179, 182, 476.
Mackenzie, G. M., 822.
McKenzie, M. A., 72, 359, 783, 790.
McKercher, D. G., 108.
McKibbin, J. M., 95, 126, 236.
Mackie, D. B., 526.
Mackie, W. W., 500.
Mackinney, G., 745.
McKinney, H. H., 35, 346.
McKinney, L. L., 17.
MacKinnon, J. E., 467.
McLachlan, H., 269.
MacLachlan, J. D., 504.
McLaren, G. C., 448.
McLarty, D. A., 468.
McLaughlin, F. A., 335.
MacLaury, D. W., 432.
MacLean, A., 129.
McLean, J. C., 344.
McLean, J. G., 575.
*McLean, R., 506.*
McLean, R. A., 70, 72.
MacLeod, A., 265, 693.
MacLeod, F. L., 564.
MacLeod, H. P., 100.
McLeod, J. A., 244.
MacMasters, M. M., 436.
MacMillan, H. G., 177.
McMurtrey, J. E., Jr., 54, 601.
McNall, P. E., 117.
McNamara, R. L., 410.
McNeal, X., 256.
McNeely, J. G., 116.
McNeill, J. M., 554.
McNew, G. L., 75, 348.
*McNutt, S. H. 396.*
McOmie, W. A., 111.
McPherson, W. W., 259.
*MacPhillamy, H. B., 189.*
Macrae, T. F., 280, 711.
McVeigh, W. J., 269.
McVey, F. L., 144, 431.
McWhorter, F. P., 344, 346, 820.
Macy, H., 102, 104, 673.
Macy, I. G., 128, 282.
Macy, R. W., 515.
Madden, R. J., 133, 236.
Maddock, S., 414.
Maddox, D., 274.
Maddox, J. G., 115.
Madsen, D. E., 110, 391, 534
Madsen, L. L., 97, 382.
Madsen, M., 532.
Magee, C. J. P., 789.
Magie, R. O., 211.
Magill, E. C., 576.
Magness, J. R., 355.
Magruder, R., 489, 627, 772.
Magyar, I., 566.
Mahoney, C. H., 201.
Maier, W., 508.
Maines, W. W., 374.
Maki, T. E., 199.
Malan, A. I., 425.
Mallman, W. L., 237.
Malloch, W. S., 468.
Malmberg, M., 415.
Malotky, L. D., 719.
Mancini, F., 859.
Maney, T. J., 197.
Mangelsdorf, P. C., 575.
Mangold, E., 386.
Mangus, A. R., 689.
Manis, H. C., 144, 521.
Manis, W. E., 512.
Manly, M. L., 264.
Mann, H. C. C., 412.
Mann, L. B., 839.
Manning, J. R., 386.
Manning, P. D. V., 383, 812.
Manus, T. F., 22, 68, 201.
Manwell, R. D., 113, 821.
Marble, A. L., 795.
Marchi, I. de, 641.
Marcovitch, S., 218, 519.
*Marcy, L. F., 230, 231.*
Margolin, R. L., 836.
Mark, H., 573.
Markely, M. C., 293, 294.
Marlatt, A. L., 126, 144.
Marlatt, C. L., 83, 144.
Marlow, H. W., 332.
Marquardt, J. C., 103, 241, 392, 674, 818.
Marquis, J. C., 887.
Marr, J. C., 738.
Marrero, F., 581.
Marschner, F. J., 407.
Marsh, H., 246.

Marshall, C. E., 8.
Marshall, E. K., Jr., 822.
Marshall, G. E., 83, 355, 524.
Marshall, M. S., 817.
Marston, A. R., 52, 483.
Martell, E. R., 431.
Martin, A. J. P., 231.
Martin, A. L., 206.
Martin, A. R., 860.
Martin, C. L., 805, 823.
Martin, D. S., 286.
Martin, E. V., 32.
Martin, G. W., 202.
Martin, H., 72, 793.
Martin, I. L., 454.
Martin, John H., 220, 485.
Martin, Jos. H., 44, 253, 386, 388, 431.
Martin, J. N., 50.
Martin, J. P. 501.
Martin, L. F., 345.
Martin, R. J., 157.
Martin, V. D., 150, 296.
Martin, Willard H., 242, 673.
Martin, William H., 73, 353, 718.
Martin, W. J., 783, 831.
Martin, W. P., 164.
Martini, M. L., 470.
Martorell, L. F., 83, 525, 651, 652.
Martyn, D. F., 157.
Maruyama, C. I., 528.
Maschmann, E., 467.
Mason, D. D., 299.
Mason, H. G., 548.
Mason, I. C., 335, 630, 631.
Mason, J. E., 697.
Mason, P. W., 369.
Massey, L. M., 360.
Matheson, R., 216, 541.
Mathews, F. P., 544, 680.
Mathews, O. R., 622.
Matsumoto, T., 201.
Matsuura, M., 500.
Matthes, G. H., 305.
Matthews, C. A., 608, 674, 815.
Matthews, L. H., 182.
Matthews, N. L., 239.
Mattice, W. A., 50.
Mattison, J. E., 480, 501.
Mattson, O., 514.
Mattson, S., 23.
Maude, P. F. 606.
Maughan, W., 632.
Maurer, S., 711.
Maw, W. A., 386, 388, 533.
Maxson, A. C., 209, 854.
Maxton, J. L., 690.
May, C., 346, 782, 790.
May, C. O., 117.
May, E. L., 531.
Mayer, D. T., 229.
Mayer, E. L., 661.
Mayer, L. S., 481.
Mayfield, H. L., 276.
Maymone, B., 474.
Maynard, L. A., 231, 277, 301, 382, 456, 675.
Mayoue, G. C., 503.
Mayr, E., 754.
Mazer, C., 331.
Mazer, M., 331.
Mead, T. H., 297.
Meade, F. J., 719.
Meader, E. M., 493.
Means, R. H., 97, 234, 805.
Mecchi, E., 812.
Medcof, J. C., 522.
Medi, E., 18.
Medish, M. N., 784.
Medlar, E. M., 822, 825.
Medler, J., 516.
Megee, C. R., 54, 101.
Meginnis, H. G., 67.
Mehlich, A., 300, 312.
Mehrhof, N. R., 386, 665.
Meier, A. A., 362.
Meigs, E. B., 391, 675.
Meites, J., 328.
Mela, B., 822.
Melampy, R. M., 803.
Melchers, L. E., 782.
Meldrum, H. R., 50.
Melhus, I. E., 68, 69.
Mellanby, E., 426.
Melling, T., 127.
Mellon, R. R., 822.
Melnick, D., 11, 132, 731, 853.
Melnick, J. L., 731.
Melsted, S. W., 719.
Méndez, F., 617, 625, 666.
Mendiola, N. B., 720.
Menendez Ramos, R., 5.
Menton, J., 822.
Mer, C. L., 747.
Mercer, R. E., 259.
Merchant, C. H., 405.
Merkle, F. G., 742.
Merriam, O. A., 843.
Merrill, H. A., 651.
Merrill, S., Jr., 780.
Merrill, T. A., 776.
Merritt, P. P., 10.
Meshew, M. H., 382.
Metcalf, C. L., 83, 516.
Mettler, S. R., 810.
Metzger, C. H., 208, 209, 575.
Metzger, F. W., 660.
Metzger, H. J., 244.
Metzger, J. E., 288.
Metzger, W. H., 173.
Metzler, W. H., 123, 557.
Meulengracht, E., 242, 243.
Meuli, L. J., 344.
Meunier, P., 416.
Meyer, E. C., 383.
Meyer, H. H., 422.
Meyer, J. H., 239.
Meyer, K. F., 823.
Meyer, R. K., 42, 830.
Miao, C. P., 519.
Michael, C. E., 237, 431.
Michelbacher, A. E., 85, 663, 664.
Michener, H. D., 479, 488.
Michimoto, H., 570.
Mick, A. H., 307.
Mickel, C. E., 228, 379.
Mickel, G. E., 379.
Mickelsen, O., 126, 276.
Mickelson, M. N., 725.
Middlekauff, W. E., 653.
Middleton, G. K., 188.
Middleton, J. T., 780, 782.
Middleton, W. E. K., 738.
Midgley, A. R., 593, 744.
Mighell, R. L., 555.
Migicovsky, B. B., 675.
Milas, N. A., 585.
Milbrath, D. G., 500.
Milbrath, J. A., 64, 647.
Miles, H. A., 689.
Miles, J. R., 591.
Miley, C. C., 501.
Milk, R. G., 554.
Millar, C. E., 489.
Miller, A., 864.
Miller, B. F., 467.
Miller, C. D., 562.
Miller, C. O., 438.
Miller, E., 843.
Miller, E. S., 667, 764.
Miller, E. V., 63, 496, 509, 510.
Miller, H. D. O., 799.
Miller, H. W., 160.
Miller, I., 847.
Miller, J. C., 178, 627, 767, 772.
Miller, J. H., 40, 596, 636.
Miller, K., 674.
Miller, L. I., 519, 576.
Miller, M. F., 159, 160, 721, 745.
Miller, M. R., 540.
Miller, P. A., 500.
Miller, P. G., 538, 675, 815.
Miller, P. R., 68, 636, 780, 781, 783.
Miller, R. C., 381, 667, 809.
Miller, R. F., 826.
Miller, V. L., 236, 534.
Miller, W. C., 810.
Miller, W. L., 438.
Miller, W. T., 543.
Milligan, J. W., 740.
Milliron, H. E., 226, 228.
Mills, A. M., 542.
Mills, H. B., 219.
Milne, L. J., 224.
Milner, R. T., 443.
Milum, V. G., 94.
Minckler, L. S., 66.
Minett, F. C., 247.
Minn, 488.
Minneman, P. G., 262, 555.

Minor, F. W., 37, 322, 463, 467.
Minot, G. R., 243.
Misner, E. G., 386.
Missiroli, A., 821.
Mitchell, C. A., 108, 752.
Mitchell, D., 558.
Mitchell, D. R., 117.
Mitchell, H. H., 229, 230, 381.
Mitchell, H. S., 668, 843.
Mitchell, J., 449.
Mitchell, J. H., 439, 529, 535, 806.
Mitchell, J. W., 319, 461.
Mitchell, R. S., 510.
Mitchener, A. V., 519.
Mitin, M., 324.
Mixner, J. P., 608.
Mixon, C. L., 745.
Moats, R. W., 549.
Moe, L. H., 395.
Moewus, F., 468.
Moffett, C. W., 287.
Moffett, H. C., 182, 229.
Mohler, J. R., 44.
Moldenke, H. N., 596.
Molina, R. R., 682.
Molinary Salés, E., 617, 625.
Møller, E., 395.
Molnár, S., 419.
Monclova, H. E. C., 581.
Monosmith, R. O., 64.
Monroe, C. F., 675.
Monroe, D., 286, 861.
Monroe, M. M., 430.
Montfort, P. T., 115.
Montgomery, P. H., 454.
Mooers, C. A., 574.
Mook, P. V., 500, 790.
Moore, D. C., 198.
Moore, E. B., 499.
Moore, E. J., 779, 780, 781.
Moore, E. N., 547, 673, 674.
Moore, G. R., 109.
Moore, H. C., 608, 814.
Moore, H. R., 406, 554.
Moore, J. B., 90, 190, 217, 367.
Moore, J. E., 629.
Moore, J. G., 335.
Moore, J. S., 528, 535.
Moore, L. A., 675, 814.
Moore, M. R., 503.
Moore, M. L., 14.
Moore, T., 231.
Moore, W., 793.
Moore, W. C., 514.
Moore, W. D., 212, 788.
Morales, J. O., 689.
Morales-Otero, P., 822.
Moran, E. A., 396.
Moreau, L., 223.
Morenas, L., 425.
Morgan, A. F., 412.
Morgan, B. B., 791.
Morgan, C. L., 529, 540.
Morgan, D. O., 397.
Morgan, I. M., 819.
Morgan, M. F., 594.
Morgan, M. N., 470.
Morgareidge, K., 284, 856.
Morison, F. L., 552.
Morofsky, W. F., 650.
Morrell, E., 530.
Morrill, A. W., Jr., 517.
Morrill, C. C., 679.
Morris, A. J., 540.
Morris, H. E., 344.
Morris, N., 856.
Morris, O. M., 190.
Morris, S. B., 699.
Morris, S. O., 270.
Morris, V. H., 654.
Morrison, F. B., 382, 809.
Morrison, F. L., 532.
Morrison, H. B., 674, 815.
Morrison, H. E., 85.
Morrison, R., 862.
Morrow, E. B., 631.
Morrow, K. S., 608, 814.
Mortensen, E., 776.
Mortenson, W. P., 117.
Morton, F. A., 516.
Mosbacher, E. G., 719.
Moser, A. M., 562.
Moser, F., 448.
Moses, A., 820.
Moses, C. S., 648.
Moss, H. C., 449.
Mosseray, R., 467.
Mottern, H. H., 150.
Mottram, J. C., 425.
Moulton, F. R., 41.
Mouriquand, G., 425.
Mowat, E. L., 343.
Mowry, H., 616.
Moxon, A. L., 455, 531, 680.
Moznette, G. F., 519.
Mrak, E. M., 156, 346.
Mueller, C. D., 534.
Mueller, W. O., 593.
Mueller, W. S., 673, 674, 814, 843, 862.
Muenscher, W. C., 606.
Muir, G. W., 383, 385.
Mulford, F. L., 199.
Mull, L. E., 674.
Mullen, L. A., 160.
Muller, A. S., 596, 636.
Muller, C. H., 753.
Müller, H., 386.
Mumford, F. B., 287, 721, 862
Mundinger, F. G., 368.
Münichsdorfer, J., 387.
Munn, M. T., 770.
Munro, G. H., 157.
Munro, J. A., 216, 226, 516, 803.
Munsell, H. E., 130, 136.
Murer, H. K., 238.
Murlin, J. R., 271.
Murneek, A. E., 59, 153, 189, 194, 629.
Murphy, A. M., 354.
Murphy, E., 423.
Murphy, E. F., 411.
Murphy, H. C., 481.
Murphy, J. B., 820.
Murphy, L. M., 719.
Murphy, R. R., 388.
Murray, E. G. D., 466.
Murray, N. C., 115.
Murray, W. G., 405.
Murrill, W. A., 202.
Musgrave, A. J., 793.
Mussehl, F. E., 533.
Musser, A. M., 340, 488, 630.
Musulin, R. R., 281.
Myers, J., 725.
Mylon, E., 823.
Myrbäck, K., 668.
Mystkowski, E. M., 855.

Nadal, R., 254.
Naeslund, C., 467.
Naess, T., 732.
Naffziger, L. M., 160.
Naftel, J. A., 151.
Nagel, C. M., 641.
Nagel, R. H., 443, 515, 516.
Nagelschmidt, G., 593.
Nagy, G. de S.-, 613.
Nahm, L. J., 37.
Nakazawa, R., 468.
Nalbandov, A., 42, 179.
Nash, L. B., 767.
Natal'ina (Nataljina), O. B., 784.
Nathanson, I. T., 615.
Naude, C. P., 358.
Naylor, A. W., 176, 458.
Naylor, E., 37.
Naylor, N. M., 6, 296, 583.
Neal, D. C., 780, 781.
Neal, J. H., 160.
Neal, N. P., 333.
Neal, W. M., 665, 675.
Neave, F. K., 440.
Nebel, B. R., 193, 465, 753.
Neel, L. R., 481, 529, 535.
Nehring, K., 669.
Neish, A. C., 34.
Neiswander, C. R., 654, 833.
Neiswander, R. B., 518.
Neller, J. R., 49, 592, 616, 624, 634, 687.
Nelsen, O. E., 478.
Nelson, A. A., 139.
Nelson, A. G., 835.
Nelson, C. E., 185.
Nelson, C. I., 844.
Nelson, D., 331, 614.
Nelson, D. H., 816.
Nelson, E. W., 186, 618.
Nelson, F. E., 242, 392, 673.
Nelson, H. A., 6.
Nelson, J. W., 545, 675.
Nelson, L., 409, 558, 697.
Nelson, M., 47, 864.

Nelson, M. H., 719.
Nelson, P., 405.
Nelson, P. M., 131.
Nelson, R. C., 339.
Nelson, R. H., 216.
Nelson, V. E. 131.
Nesbit, M. E., 675.
Nesom, R. Y., 783.
Nettles, V. F., 624.
Neubert, A. M., 150.
Neuenschwander-Lemmer, N., 570.
Nevens, W. B., 392, 675.
Newcomer, E. H., 171, 752.
Newell, W., 718.
Newhall, A. G., 355, 649, 782, 832.
Newiadomsky, 820.
Newlander J. A., 667.
Newman, K. R., 725.
Newton, J. M., 583.
Newton, M., 207, 326, 346.
Nicewonger, R., 679.
Nichita, G., 385.
Nicholls, W. H., 405, 834.
Nichols, L., 846.
Nichols, P. F., 156.
Nicholson, L. G., 827.
Nickels, C. B., 370, 519.
Nickerson, J. T. R., 388.
Niederhauser, J. S., 646.
Niel, C. B. Van, 467.
Nielsen, E., 382.
Nielsen, E. L., 47.
Nielsen, F. W., 108, 679.
Nielsen, H. M., 110 534.
Nielsen, N., 468.
Nielson, H. M., 391.
Niemeyer, W. E., 112.
Nikiforoff, C. C., 451.
Nikolaev, R. P., 784.
Nilsson, F., 172.
Nimalasuriya, A., 846.
Nitsche, H., 670.
Nitta, K., 105.
Niven, C. F., Jr., 674
Nixon, E. L., 432.
Nobata, R. 678.
Noble, C. V., 693.
Noble, G. K., 615.
Noble, W. B., 652.
Noguera, J. R., 689.
Nolan, A. F., 684.
Nolla, J. A. B., 5, 625, 718.
Nord, F. F., 468.
Norman, A. G., 28.
Norris, L. C., 151, 152, 253, 386, 534, 668 811.
Norris, R. T., 793.
Norton, C. E., 155.
Norton, L. B., 219, 653.
Norton, L. J., 405, 839.
Notevarp, O., 701.
Novikov, V. A., 334.
Nugent, T. J., 68, 212.
Nuissl, F. J., 101.
Nusbaum, C. J., 501, 780.
Nutt, G. B., 480.
Nutting, M.-D. F. 328.
Nyfeldt, A., 685.

Obenshain, S. S., 299.
Oberhansley, F. R., 249.
Oberling, C., 820.
Oberndorfer, S., 820.
O'Brien, B. 856.
O'Brien, G. E., 745.
O'Brien, J. R., 385.
Ochoa, S., 712.
Oden, J. W., 134.
Oden, L. H., Jr., 134.
Oderkirk, A. D., 387.
Oderkirk, G. C., 523.
Odland, T. E., 58, 334.
Oertel, E., 227.
Offord, H. R., 82.
Offutt, E. B., 432.
Ogaard, A. T., 569.
Ogden, H. P., 481.
Ogden, W. B., 78, 333, 334.
O'Kane, W. C., 796.
O'Kelly, J. F., 58, 143, 185, 479.
Okey, R., 668.
Okuno, Y., 105.
Olafson, P., 545.
Olcott, H. S., 668.
Olcott, M. T., 555.
Oleson, J. J., 126, 382, 386, 533, 567, 667, 668.
Olitsky, P. K., 400, 819.
Olitzki, L., 685, 821.
Oliveira, J. M., 649.
Oliver Gonzalez, J., 682.
Oljhovikov, M. A., 603.
Olmer, D., 820.
Olmer, J., 820.
Olney, J. F., 546.
Olsen, A., 444.
Olsen, N. A., 576.
Olsen, O. W., 363.
Olson, C., Jr., 253, 823.
Olson, F. C., 530.
Olson J. C., 673.
Olson, L. C., 781.
Olson, O. E., 455, 531, 748.
Olson, T. M., 246, 535, 536.
Olsson, N., 385.
O'Mara, J. G., 185.
Oort, A. J. P., 503.
Oosting, H. J., 171.
Opie, R. S., 647.
Oppenheimer, C., 462.
Opper, L., 127, 864.
Orla-Jensen, S. 468.
O'Rourke, F. L., 498.
Orr, A. E., 258.
Orr, J. B., 844.
Orr, J. H., 822.
Orr, L. W., 657.
Orrben, C. L. 598.
Ortiepp, R. J., 827.
Osburn, M. R., 379.
Osgood, E. E., 248.
Osmer, T. L. G., 515.
Osmun, A. V., 783.
Osteen, O. L., 541, 826.
Osterberg, A. E., 424.
Osztrovszky, A. v., 701.
Otanes, F. Q., 519.
Otero, P. M.-, 822.
Ottenstein, B., 820.
Otto, G. F., 821.
Ounsworth, L. F., 192.
Overbeek, J. Van, 318, 461.
Overholser, E. L., 190, 202, 367, 630, 795.
Overholts, L. O., 324, 456.
Overley, F. L., 185, 190, 202, 217, 367, 795.
Overman, O. R., 102.
Overman, R., 105.
Overpeck, J. C., 590, 619.
Overstreet, M. R., 699.
Overstreet, R., 6.
Owen, C. A., 423.
Owen, C. R., 185, 765.
Owen, F. V., 354.
Owens, C. E., 344.
Oyama, T., 105.

Pacheco, S. D., 689.
Paddick, M. E., 575.
Paddock, F. B., 516.
Paden, W. R., 480.
Pady, S. M., 204.
Page, J. B., 160.
Paillot, A., 223.
Painter, E. P., 599.
Painter, R. H., 515, 656.
Painter, T. S., 326.
Palkin, S., 588.
Pallesen, J. E., 159.
Palm, C. E., 659.
Palmer, E. F., 198.
Palmer, L. S., 378, 530, 545, 674, 675.
Palmer, N., 425.
Palmer, W. C., 287, 863.
Palo, M. A., 351.
Palcheimo, L., 668.
Pan, C. L., 41.
Pan, S. C., 6.
Pandittesekere, D. G., 700.
Panfilova, E. P., 326.
Pape, H., 218, 360.
Papi, U., 689, 695.
Pardue, L. G., Jr., 740.
Paris, C. D., 745.
Park, C. F., Jr., 402.
Park, M., 211.
Parker, E. C., 50.
Parker, E. R., 63.
Parker, H. D., 782.
Parker, J. E., 389, 476.
Parker, J. R., 516.
Parker, K. G., 213.
Parker, M. E., 678
Parker, M. M., 627, 772.

Parker, M. W., 457, 746.
Parker, O., 781.
Parker, R. B., 781.
Parker, R. L., 222, 516.
Parker, R. R., 107, 820.
Parkes, A. S., 610.
Parkin, E. A., 527.
Parkinson, L. R., 843.
Parris, G. K., 213, 345, 488, 500.
Parrott, E. M., 229.
Parrott, I. M., 188.
Parson, H. E., 510.
Parsons, C. H., 813.
Parsons, H. T., 126.
Parsons, L. C., 386.
Parvin, D. W., 688.
Paschal, J. L., 835.
Pastor Rodríguez, J., 617.
Patrick, C. S., 480.
Patrick, S. H. M., 603.
Patrushev, V. I., 42.
Patty, R. L., 589.
Patzer, W. E., 342.
Paul, H., 475.
Paulus, J. H., 364.
Payne, F., 614.
Payne, L. F., 389.
Peace, T. R., 81.
Peacock, G. E., 667.
Peacock, N. D., 445.
Peacock, P. R., 820.
Peacock, W. M., 225.
Pear, C. B., Jr., 738.
Pearce, G. W., 86, 584.
Pearce, S. C., 519.
Pearse, H. L., 318.
Pearson, C. S., 448.
Pearson, F. A., 115.
Pearson, G. A., 633.
Pearson, P. B., 382, 532.
Pearson, R. A., 268.
Pearson, R. W., 22, 161.
Pederson, C. S., 156, 436.
Peebles, R. H., 484, 596.
Peech, M., 309, 592.
Peele, T. C., 311, 448.
Pemberton, C. E., 665.
Pencharz, R. I., 612, 758.
Penczek, E. S., 673.
Penfound, W. T., 603.
Pennington, D., 668.
Penquite, R., 812.
Pentimalli, F., 820.
Pentzer, D. J., 155.
Pepper, B. B., 377, 652.
Pepper, J. O., 524.
Peppler, H. J., 100.
Perak, J. T., 473.
Percival, G. P., 760, 761.
Pereira, C., 401.
Perkins, A. T., 173, 174.
Perkins, M., 122.
Perkins, N. L., 719.
Perla, D., 565, 566.
Perry, E. J., 178.
Perry, M., 286.
Persing, C. O., 219, 523.
Person, H. L., 801.
Person, L. H., 635, 780.
Personius, C. J., 269.
Pessin, L. J., 746.
Petering, H. G., 438.
Peterman, J. E., 542.
Peters, B. L., 160.
Peters, C. A., 436.
Peters, R. A., 280.
Petersen, W. E., 238, 391, 674.
Peterson, A. G., 404.
Peterson, E., 126.
Peterson, E. H., 538.
Peterson, L. C., 353.
Peterson, L. O., 516.
Peterson, R. F., 207.
Peterson, W. H., 6, 95, 344, 437, 456, 460, 468, 815.
Peterson, W. J., 389, 456, 667.
Petrányi, J., 419.
Pett, L. B., 467.
Pfeiffer, C. A., 44, 329.
Pfeiffer, H. H., 606.
Pfeil, E., 346.
Pharis, L. L., 178.
Phelps, E., 861.
Phelps, E. L., 427.
Philip, C. B., 244, 528.
Phillipps, H., 738.
Phillips, A. M., 92, 227.
Phillips, C. E., 48, 57.
Phillips, E. W. J., 527.
Phillips, H. M., 753.
Phillips, M., 231.
Phillips, P. H., 95, 126, 132, 178, 390, 615, 674, 675, 807.
Phillips, R. W., 178, 179, 234, 235, 381, 573.
Phillips, T. G., 760.
Piccard, J., 18.
Pickels, E. G., 819.
Pickett, A. D., 522, 523.
Pickett, B. S., 60.
Piekarski, G., 467.
Piemeisel, R. L., 354, 743.
Pierce, W. C., 370, 519.
Pierpont, R. L., 85.
Pierre, W. H., 22, 25, 50.
Pike, R. M., 822.
Pinchot, G., 8, 182.
Pinckard, J. A., 72, 506.
Pinckney, J. S., 92, 227.
Pincus, G., 47.
Pincus, J. W., 324.
Pingrey, H. B., 258.
Pinkerton, H., 252.
Piper, A. M., 402.
Pirie, J. H., 541.
Pirie, N. W., 345.
Pirone, P. P., 201, 360, 649.
Pitner, J., 48, 479.
Pittman, D. W., 334.
Pkhakadze, G. M., 326.
Plakidas, A. J., 780, 781.
Plastridge, W. N., 822.
Platenius, H., 772.
Platt, B. S., 279.
Platt, C. S., 388, 671.
Platz, B. R., 126.
Pletsch, D. G., 344.
Plimmer, V. G., 844.
Ploux, G., 346.
Plueger, C., 719.
Plum, N., 108, 112, 679.
Plum, P., 285.
Plummer, B. E., Jr., 344.
Podhradský, J., 387.
Poe, C. F., 416.
Poehlman, J. M., 185, 229.
Poland, G. L., 136.
Poley, W. E., 533, 671.
Poling, C. E., 568.
Polk, H. D., 236, 666.
Polskin, L. J., 672.
Polson, R. A., 842.
Pommerenke, W. T., 413.
Pond, G. A., 689, 690.
Poole, R. F., 780, 781.
Poos, F. W., 211, 787.
Popesco, I., 386.
Popham, W. L., 206.
Popp, H. W., 461.
Porter, D. A., 398, 543.
Porter, D. R., 337.
Porter, R. H., 50, 68, 69, 82.
Porter, W. L., 432.
Posnette, A. F., 358.
Posternak, T., 467.
Potgieter, M., 562.
Potter, C., 793.
Potts, R. C., 102, 386.
Pounden, W. D., 807.
Powell, D., 509.
Powell, E. L., 667.
Powell, P. J., 740.
Pratt, R., 39.
Prebluda, H. J., 10.
Prentice, B. N., 431.
Pressley, E. H., 260.
Preston, G., 320.
Preston, R. D., 170, 466.
Preston, R. J., Jr., 457.
Prezent, I. I., 324.
Pribram, E. A., 467.
Price, D., 531.
Price, F. E., 114.
Price, J. B., 324.
Price, W. C., 210, 347.
Price, W. V., 100, 103.
Priestley, F. W., 106, 394.
Prill, E. A., 103, 104.
Prince, A. L., 618.
Prince, F. S., 760, 761.
Pringle, E. M., 386.
Pritchett, H. D., 542.
Proctor, B. E., 301.
Prouty, C. C., 238, 392.
Prouty, W. W., 847.

Prucha, M. J., 103, 673.
Prüter, E., 135.
Pryor, D., 344.
Prytz, K., 446.
Psarev, G. M., 603.
Pucher, G. W., 438, 584, 745.
Puffeles, M., 24.
Pugsley, C. W., 575.
Pulkki, L. H., 443.
Pulkrabek, G., 103.
Punnett, R. C., 181.
Purdy, A. W., 772.
Puri, A. N., 24, 306, 307.
Puri, B. R., 303.
Purvis, E. R., 30.
Putnam, D. N., 608.
Pyenson, L., 87, 228.
Pyke, W. E., 268, 843.

Quagliariello, G., 707.
Quanjer, H. M., 205.
Quense, J. A., 588.
Quinby, J. R., 42.
Quiñones, V. L., 581.
Quintanilha, A., 468.
Quintus, P. E., 839.
Quiring, D. P., 127, 128.
Quisenberry, K. S., 503, 617, 622.
Quortrup, E. R., 686.

Rabak, F., 491.
Rabička, J., 599.
Rabinowitch, I. M., 272.
Radabaugh, J. H., 387.
Rademacher, B., 599.
Radulesco-Calafat, G., 701.
Ragland, C. H., 198.
Ragsdale, A. C., 185, 238, 674, 759, 806.
Rahn, E. M., 773.
Rahn, O., 323, 467.
Rainey, W., 542.
Rainwater, C. F., 519.
Raistrick, H., 745.
Rajagopalan, V. R., 250.
Raleigh, S. M., 335.
Ralston, N. P., 759.
Ramírez, J. H., 581.
Ramos, R. M., 5.
Ramsbottom, J., 595.
Ramsbottom, J. M., 381.
Ramsdell, G. A., 674.
Ramsey, H. L., 793.
Randall, P. E., 515.
Randell, C. G., 839.
Randle, S. B., 95.
Randoin, L., 703.
Randolph, J. W., 829.
Randolph, L. F., 176, 465.
Randolph, U. A., 776.
Rands, R. D., 505.
Raoul, Y., 416.
Raper, J. R., 318.
Raper, K. B., 467.
Rapp, K. E., Jr., 432.
Raskopf, B. D., 256, 553.
Rasmussen, E. J., 493.
Rather, H. C., 52, 483.
Rau, P., 523.
Rauchenstein, E., 694, 835.
Rawlins, T. E., 72, 213.
Rawson, R. W., 615.
Ray, G. S., 688.
Ray, S. C., 232.
Ray, W. W., 214, 348, 648.
Rayner, M. C., 468.
Raynor, R. N., 55.
Rea, C. E., 614.
Rebrassier, R. E., 546.
Recach, V. N., 784.
Records, E., 540, 678.
Reddick, D., 70.
Reddy, C. S., 68, 69.
Redman, R., 317.
Reece, R. P., 240, 608, 614.
Reed, A. C., 425.
Reed, C. I., 562.
Reed, C. O., 575.
Reed, G. B., 41, 467, 822.
Reed, G. M., 206, 351.
Reed, H. S., 644.
Reed, I. F., 829.
Reed, J. F., 7, 343.
Rees, C. W., 106, 110.
Rees, L. W., 828.
Reese, E., 203.
Reeve, J. O., 495.
Reeves, C. G., 740.
Reeves, R. E., 35.
Regan, M. M., 118, 404.
Regnier, R., 223.
Rehder, A., 497.
Reichenow, E., 820.
Reichstein, T., 280.
Reid, J. W., 115.
Reid, W. H. E., 238 672, 674
Reid, W. J., jr., 225, 519, 799.
Reifenberg, A., 449.
Reimann, H. A., 467.
Reineke, E. P., 674.
Reinhard, H. J., 660, 800.
Reinking, O. A., 191, 211, 626, 788.
Reis, J., 400.
Reising, F., 669.
Rekach, V. N., 784.
Remsberg, R. E., 73.
Renfroe, O., 270.
Renoux, G., 822.
Rettie, J. C., 699.
Reuss, C. F., 842.
Reusser, H. W., 575.
Reuther, W., 160, 341, 624
Reynals, F. D-, 820.
Reynolds, H., 125.
Reynolds, H. J., 388.
Reynolds, L., 128.
Reynolds, M. S., 126.
Reynolds, S. R. M., 47.
Reznikoff, P., 243.
Rhoades, H. F., 31, 163.
Rhoades, M. M., 325.
Rhoads, A. S., 358, 634.
Rhoads, C. P., 242.
Riachovsky, N. A., 784.
Rice, C. C., 862.
Rice, J. E., 288.
Rich, A., 344.
Rich, A. E., 208.
Rich, A. R., 824.
Richard, J., 740.
Richards, B. L., 507.
Richards, L. A., 162.
Richards, M. C., 213.
Richards, O. W., 726.
Richards, S. J., 163.
Richardson, A. P., 824.
Richardson, C. H., 85.
Richardson D. E., 17.
Richardson, H. H., 365.
Richardson, J. B., 480.
Richardson, J. E., 276.
Richardson, L. R., 229.
Richardson Kuntz, P., 617.
Richert, D., 332.
Richter, C. P., 129, 132.
Richter, H., 32.
Richter, K., 388.
Riddle, O., 332, 478.
Rider, J. R., 824.
Riedl, W. A., 334.
Riegel, B., 15, 445, 587.
Rieman, G. H., 333, 344.
Riemenschneider, R. W., 587.
Ries, J. v., 346.
Rietschel, H., 715.
Rievel, H., 388.
Rigler, N. E., 203, 502.
Rigor, T. V., 392.
Riker, A. J., 41, 344, 346, 509.
Riley, E., 551.
Riley, H. W., 404.
Riley, W. A., 516, 799.
Rimington, C., 822.
Rinehart, E. F., 381.
Ringoen, A. R., 478.
Ringrose, R. C., 529, 540.
Riollano, A., 625, 635.
Ripperton, J. C., 479, 528.
Rischkow, V. L., 345.
Ritcher, P. O., 800.
Ritchey, G. E., 616.
Ritchie, W. S., 725, 843, 862
Ritsert, K., 440.
Rittenhouse, G., 741.
Ritter, C., 456.
Ritter, G. J., 456.
Ritzman, E. G., 805, 814.
Ritzmann, J., 382.
Rivaz, C. P., 448.
Rivera Hernández, G., 666, 805, 806.
Rivers, T. M., 820.
Rivnay, E., 523.
Roadhouse, C. L., 393, 539.
Roark, R. C., 363, 793.
Robbins, F. S. R., 572.
Robbins, G. B., 469.

Robbins, R. C., 268, 719.
Robbins W. J., 461, 467.
Robbins, W. R., 313, 460.
*Robert, A. L.*, 69.
Robert, J. C., 479.
Roberts, C. A., 257.
Roberts, E., 43, 387.
Roberts, E. A., 602.
Roberts, E. H., 399.
Roberts, J., 719.
*Roberts, L. J.*, 708, 848.
Roberts, O. C., 771.
Roberts, W. M., 536.
Robertson, D., 362.
Roberston, D. W., 189, 754, 863.
Robertson, E. I., 98, 229, 386.
*Robertson, L.*, 262.
Robertson, M., 821.
Robertson, O. H., 822.
Robinette, W. L., 215.
Robinson, C. H., 383.
Robinson, H. F., 188.
Robinson, J. L., 50, 51.
Robinson T. W., 402.
Robinson, W. B., 518.
Robinson, W. D., 853.
Robinson, W. O., 166.
Robison, W. L., 96.
Robles, M. M., 236, 757.
Robotka, F. 116.
Robscheit-Robbins, F. S., 572.
Roche, B. H., 95.
Rochford, L. H., 532.
Rodenhiser, H. A., 41, 350, 503.
Rodgers, N., 6.
Rodigin, M. P., 784.
*Rodrigues, A.*, 169.
Rodrigues, C., 396.
Rodriguez, J. P., 617, 651.
Rodriguez Molina, R., 682.
Roe, A. F., 595.
Roe, H. B., 403.
Roelofs, E. W., 449.
*Roemer, T. E.*, 346.
Roepke, M. H., 106.
Roeser, J., Jr., 65.
Rogeness, O., 835.
Rogers, C., 388.
Rogers, C. F., 239, 293, 303.
Rogers, C. H., 781.
Rogers, L. A., 100.
Rogers, L. H., 450, 581.
Rogers, R. E., 383, 428.
Rogers, W. P., 686.
Rogick, M. D., 752.
Rogosa, M., 100, 673.
Rohwer, C., 304, 548.
Rohwer, S. A., 83.
Roland, C. T., 817.
Roller, E. M., 480.
Roman, G., 822.
Roman, W., 462.
Romanoff, A. L., 99, 886.
Romberg, L. D., 777.
Roosevelt, F. D., 1.
Roque, A., 617, 625.
*Rosa, J. S.*, 525, 665.
Rosen, H. R., 53, 68, 360, 639.
Rosenblum, L. A., 850.
Rosenfels, R. S., 189.
Rosenthal, S. M. 822.
Ross, B., 168.
Ross, M. A., 477.
Ross, O. B., 382.
Rossiter, R. J., 280, 712.
Rost, C. O., 310.
Roth, L. F., 344.
Rothgeb, R. G., 192.
Rothschild, M., 305.
Rourke, G. M., 424.
Rous, P., 820.
Routh, J. I., 587.
Rowe, H. B., 405, 693.
Rowe, L. S., 2.
Rowe, P. B., 497.
Roy, D. N., 373.
Royer, G. L., 456.
Rozeboom, L. E., 395.
Rozman, D., 835.
Ruben, S., 604.
Rubinstein, H. S., 330.
*Rudnick, D.*, 182.
Rudra, M. N., 422.
Rüegger, A., 733, 735.
Ruehe, H. A., 103, 674.
Ruehle, G. D., 357, 634.
Ruggles, A. G., 368.
Ruhe, D. S., 252.
Ruhland, H. H., 542.
Rule, A. M., 244.
Rule, G. K., 165.
Rupel, I. W., 42, 95, 333, 675.
Rush, J. D., 554.
Rusk, H. A., 726.
Rusk, H. P., 381.
*Rusk, H. W.*, 216, 652.
Rusoff, L. L., 386, 665.
Russ, S., 43.
Russel, J. C., 29.
Russell, H. G., 650.
Russell, M. B., 162.
Russell, S., 864.
*Russell, S. W.*, 387.
Russell, W. C., 98, 672.
Russell, W. L., 180.
Ruth, W. A., 219, 338.
Rutledge, D. I., 425.
Ruyle, E. H., 302.
Ryakhovskii (Riachovsky), N. A., 784.
Ryall, A. L., 795.
Ryerson, K., 289.
Ryff, J. F., 255.
Ryu, E., 105.

Sabrosky, C. W., 92, 793.
Sackman, R. F., 160, 618.
Sadovskaja, R. O., 334.
Sadr, M. M. El-, 280, 711.
Saenz, A., 822.
St. Clair Feilden, G., 625.
St. Emilian, D., 701.
St. John, J. L., 150, 190, 217, 229, 248, 544, 684.
Sajurilo, V. K., 784.
Sakimura, K., 205, 220, 797.
Salés, E. M., 617, 625.
Salisbury, E. J., 158, 595.
Salisbury, G. W., 178, 757.
Salmon, W. D., 130, 668.
Salomon, H., 733, 735.
Salter, L. A., Jr., 719.
Salter, R. M., 450, 575.
*Salzwedel, H.*, 387.
Sammis, J. L., 104.
Sampson, W. L., 586.
Samter, M., 96.
Sanborn, R., 757.
Sanchez, P. C., 306.
Sandberg, M., 565, 566.
*Sanders, D. A.*, 677, 679, 680.
Sanders, G. P., 674.
Sanders, K. B., 448.
Sanderson, D., 842.
Sanderson, M. W., 84.
Sanderson, N. H., Jr., 346.
Sanderson, T., 443.
*Sandstedt, R. M.*, 436, 440, 441, 442.
Sandsten, E. P., 338.
Sanguineti, M. E., 471.
Sansum, W. D., 563.
Sant, P. T., 553.
Sargent, M. C., 317.
Sarle, C. F., 17, 115.
Sarles, M. P., 821.
Sass, J. E., 745.
Sasscer, E. R., 85.
Satina, S., 456.
Sato, S., 105.
Satterfield, G. H., 282, 854.
Sauer, H. F. G., 369, 379.
Saugstad, S., 216, 515.
Saunderson, M. H., 258.
Sauter, E., 467.
Savage, E. F., 431.
Savage, E. S., 675.
Savage, Z., 693.
Saville, R. J., 689, 834.
Sawyer, C. E., 253.
Sayles, E. D., 478.
Sayre, C. B., 193.
Scales, J. W., 543.
Scanlan, J. J., 387, 695.
Scarborough, H., 857.
Schaal, L. A., 353, 642.
Schaars, M. A., 117.
Schaefer, C. W., 364.
Schafer, E. G., 185.
Schaible, P. J., 387, 388, 389.
Schalk, A. F., 678.
Schaller, J. A., 391, 675.
Schalm, O. W., 679.
Schantz, E. J., 95, 272, 283.
Schantz-Hansen, T., 499.

Schanzenbach, W., 468.
Schappelle, N. A., 625.
Scharer, H., 536.
Scheer, P., 716.
Scheffer, T. C., 361.
Scherff, I., 417, 709.
Schermerhorn, L. G., 336.
Scheunert, A., 707.
Schick, H., 715.
Schifino, L. A., 519.
Schlenk, F., 714.
Schlick, W. J., 256.
Schloemer, F. C., 695.
Shlotthauer, C. F., 244.
Schmalfuss, K., 603.
Schmidt, C. L. A., 572.
Schmidt, C. M., 744.
Schmidt, H., 532, 669.
Schmitt, C. G., 47, 201, 348.
Schnack, B., 473.
Schneckloth, T. A., 42.
Schneider, H. A., 126.
Schneiderhan, F. J., 509.
Schoene, W. J., 221, 798.
Schoening, H. W., 541, 542, 677, 680.
Schoenleber, L. H., 590.
Scholtz, G. D. J., 96.
Scholz, H. F., 342.
Schomer, H. A., 63, 496, 509.
Schonland, B. F. J., 305.
Schooley, J. P., 332.
Schopfer, W. H., 467.
Schopmeyer, C. S., 66.
Schoth, H. A., 764.
Schott, R. G., 179, 573.
Schrader, A. L., 197.
Schramm, W., 669.
Schread, J. C., 651.
Schroeder, H. O., 373.
Schroeder, R. A., 185, 189, 194.
Schrumpf, W. E., 405.
Schubert, A. R., 536.
Schuette, H. A., 411.
Schuh, J., 88.
Schuler, E. A., 123.
Schulman, E., 740.
Schultz, A. S., 417, 444, 468.
Schultz, T. W., 116, 404.
Schultze, M. O., 855.
Schulz, L., 19.
Schumacher, A. E., 668.
Schumacher, F. X., 632.
Schuster, G. L., 48, 94, 143.
Schutze, H. L., 823.
Schwantes, A. J., 719.
Schwardt, H. H., 663.
Schwarte, L. H., 250, 541.
Schwartz, B., 821.
Schwartz, W., 467.
Schwartze, C. D., 190.
Schwarz, E. R., 860.
Schweitzer, C. E., 15, 445.
Schweizer, M., 757, 758.
Schwendiman, A., 333.
Schwendiman, J. L., 160, 618.
Schwenger, R. B., 555.
Scorgie, N. J., 810.
Scotland, M. B., 525.
Scott, A. L., 380.
Scott, F. M., 170.
Scott, G. M., 43.
Scott, G. W., 337.
Scott, H. M., 182, 388, 534, 667.
Scott, J. P., 823.
Scott, J. W., 246.
Scott, L. E., 480, 488.
Scoular, F. I., 413.
Scrivanich, D., 702.
Sealey, J. L., 479.
Seamans, L., 219.
Searls, E. M., 364, 516, 523.
Sears, E. R., 185.
Sears, O. H., 164.
Seath, D. M., 179.
Seaton, H. L., 126.
Sebrell, W. H., 134, 139, 859.
Secrest, E., 574.
Seeley, M., 585.
Seely, C., 185.
Sefick, H. J., 776.
Seible, D., 600.
Seidlin, S. M., 329.
Seif-el-Nasr, Abdel-Ghani, 350, 638.
Seifried, O., 819.
Sein, F., Jr., 651.
Sélariès, P., 223.
Selby, H. E., 699.
Self, F. W., 188.
Selye, H., 45, 184.
Semeniuk, G., 50, 68.
Semeniuk, W., 74.
Semen'kova, A. V., 784.
Sen, S. K., 218.
Seppilli, A., 467.
Sergeant, M. W., 78.
Serralés, J. J., Jr., 689.
Serrano, L. A., 625, 635.
Setterstrom, C., 456.
Setty, L. R., 524.
Severens, J. M., 387.
Sewell, W. H., 696.
Shahan, M. S., 541, 677, 826.
Shalucha, B., 726.
Shands, H. L., 333, 344.
Shands, R. G., 344, 770.
Shantz, E. M., 730.
Shantz, H. L., 743.
Shapiro, H., 182.
Sharp, C. C. T., 634.
Sharp, D. G., 399.
Sharp, P. F., 240, 269, 388.
Sharvelle, E. G., 784.
Shatova, E. V., 784.
Shaw, B., 25.
Shaw, H. E. B., 183.
Shaw, J. C., 391, 674.
Shaw, J. K., 771.
Shaw, K. J., 780, 782.
Shaw, L., 356, 780, 781.
Shaw, S., 189.
Shaw, W. M., 448.
Shea, K. G., 813, 843.
Shealy, A. L., 665.
Shear, G. M., 506, 798.
Shear, S. W., 267.
Shearer, G. D., 234, 681.
Shearer, P. S., 96.
Shedd, C. K., 50, 113.
Sheehy, E. J., 386.
Sheldon, A. J., 827.
Shepard, C. E., 652.
Shepard, H. H., 516, 793, 802
Shepherd, G., 120.
Shepherd, J. B., 536, 675.
Shepherd, W. O., 186, 618.
Shepperd, J. H., 268.
Sherbakoff, C. D., 501, 780, 781, 782.
Sherbinovskii (Sherbinovsky), N. S., 784.
Sherff, E. E., 596.
Sherman, F., 518.
Sherman, J. M., 674.
Sherman, R. W., 265.
Sherman, W. C., 130, 668, 729.
Sherouse, R. T., 740.
Sherrard, E. C., 737.
Sherrard, G. C., 86.
Sherry, S., 569.
Sherwood, F. W., 531.
Sherwood, R. M., 385, 390.
Shettles, L. B., 424.
Shields, R. H., 720.
Shigley, J. F., 814.
Shimer, S. R., 805.
Shimotori, N., 669.
Shinn, L. A., 675.
Shinn, L. E., 822.
Shippy, W. B., 634.
Shirky, S. B., 287.
Shirley, R. L., 153.
Shive, J. W., 460, 597.
Shohl, A. T., 571, 845.
Sholl, L. B., 541, 757.
Shope, R. E., 821.
Shorb, D. A., 111.
Shorey, E. C., 455.
Short, R. E., 677.
Shotwell, R. L., 516.
Shreve, R. N., 243.
Shuey, G. A., 436, 481.
Shultz, J. F., 7.
Sibbitt, L. D., 55.
Sibilia, C., 350.
Siddons, L. B., 373.
Sideris, C. P., 322, 584.
Siegler, E. A., 355, 356.
Siegler, E. H., 370.
Sieling, D. H., 864.
Sievers, A. F., 520.
Sievers, F. J., 862.
Sigal, A., 570.
Silberschmidt, K., 210, 346.
Silverman, M., 607, 608.
Sime, P. R., 791.

Simitch, T. V., 822.
Simmonds, J. H., 510.
Simmonds, J. P., 677.
Simmons, S. W., 224.
Simms, J. A., 676.
Simo, M., 468.
Simon, A. J., 395.
Simon, P. N., 725.
Simonart, P., 467.
Simons, J., 625.
Simons, K. W., 201.
Simpson, D. M., 780, 781.
Simpson, G. D., 405.
Simpson, G. W., 333, 344, 364.
Simpson, J. E., 165.
Simpson, M. E., 10, 45, 184, 758.
Sinclair, H. M., 419, 420.
Singh, L., 341.
Singleton, H. P., 185.
Singleton, W. R., 325.
Sinnott, E. W., 456, 606, 753.
Sipe, G. R., 529.
Sisson, W. A., 598.
Sitton, B. G., 496.
Sjollema, B., 425.
Skaptason, J. B., 353.
Skarbilovich, T. S., 362.
Skeeters, M. J., 243.
Skelding, A. D., 748.
Skinkle, J. H., 860.
Skoglund, W. C., 813.
Skold, L. N., 51, 719.
Slabaugh, R. E., 517.
Slanetz, L. W., 100, 823.
Slate, G. L., 340.
Slate, W. L., 431, 864.
Slater, C. S., 311.
Slater, E. C., 130.
Slatter, W., 241.
Sloan, L. L., 710.
Slocum, W. L., 575.
Slonaker, J. R., 703.
Slosser, J. W., 738.
Slowata, S. S., 81.
Smadel, J. E., 820.
Smart, H. F., 154.
Smenner, O., 142, 864.
Smiley, E. S., 479.
Smiley, K. L., 674.
Smit, A. J. H., 172.
Smith, A. C., 595.
Smith, A. L., 381, 780, 781, 782.
Smith, C. F., 798.
Smith, C. L., 777.
Smith, C. O., 81, 176, 647.
Smith, D. C., 50, 185.
Smith, D. W., 55.
Smith, E. G., 484.
Smith, E. L., 34, 437.
Smith, F. B., 25, 592.
Smith, F. F., 362, 655.
Smith, F. H., 585.
Smith, G. E., 189.
Smith, G. H., Jr., 118.
Smith, G. R., 452, 455, 651.
Smith, H., 385.
Smith, H. A., 575, 863.
Smith, H. P., 423, 424.
Smith, I. W., 367.
Smith, J. B., 173, 386.
Smith, J. H., 345.
Smith, J. H. C., 321, 745.
Smith, K. M., 345, 642, 784.
Smith, L., 185.
Smith, L. F., 498.
Smith, L. J., 256.
Smith, M. C., 561.
Smith, M. G., 262.
Smith, M. I., 141.
Smith, M. W., 523.
Smith, N. R., 467, 752.
Smith, O., 489, 766, 767.
Smith, P., 344.
Smith, P. G., 15, 344, 445.
Smith, P. H., 233.
Smith, R. C., 217, 367.
Smith, R. H., 89, 657.
Smith, R. L., 448, 480.
Smith, R. M., 94.
Smith, R. W., 49.
Smith, S. E., 530.
Smith, T. L., 122, 124, 410, 698.
Smith, T. O., 31.
Smith, W. K., 105.
Smith, W. O., 162.
Smith, W. W., 771.
Snapp, O. I., 662.
Snapp, R. R., 381.
Snedecor, G. W., 115.
Snell, A. M., 424.
Snell, D., 275.
Snell, E. E., 6, 95, 101, 460, 468, 668.
Snell, G. D., 614.
Snell, M. G., 234, 381, 532.
Snelling, C. E., 855.
Snelling, R. O., 765, 798.
Snider, G. G., 269, 845.
Snieszko, S. F., 28.
Snog-Kjaer, A., 468.
Snyder, E., 62, 776, 777.
Snyder, J. C., 190.
Snyder, W. C., 203.
Snyder, W. W., 814.
Snyman, P. S., 826.
Saber, H. A., 712, 713.
Soine, O. C., 310.
Somazawa, K., 678.
Somers, L. A., 772.
Sommer, A. L., 644.
Sommer, H. H., 101, 392, 815.
Somogyi, M., 726.
Sondern, C. W., 479.
Soni, B. N., 224.
Sonley, L. T., 837.
Sontag, E., 126.
Sontag, L. W., 275.
Sorensen, C. M., 818.
Sorenson, C. J., 523.
Soriano, A. M. de, 466.
Soriano, S., 466.
Sorokin, H., 644.
Sorum, C. H., 7.
Soskin, S., 330.
Sotiriadou, E., 425.
Sotola, J., 229, 544.
Souders, H. J., 128.
Soulié, H., 223.
Southwick, L., 629, 771.
Southwick, R. W., 63.
Sowell, D. F., 665.
Sowls, L., 83.
Spangler, R. L., 121.
Sparlin, E. E., 116.
Sparrow, F. K., Jr., 346, 502.
Spears, H. D., 432.
Spector, H., 561.
Spedding, F. H., 6.
Speelman, S. R., 179.
Speer, F. R., 594.
Speirs, M., 274.
Spellberg, M. A., 137.
Spencer, D. A., 96, 179.
Spencer, E. R., 623.
Spencer, G. J., 364.
Spencer, R., 545.
Spencer, V. E., 448, 540.
Spencer, W. P., 754.
Spessard, E. A., 317.
Spies, T. D., 281, 420, 425, 711, 858.
Spillman, M. R., 432.
Spillman, W. J., 432.
Spilsbury, R. H., 448.
Spinks, G. T., 59, 60.
Sprague, G. F., 185.
Sprague, G. W., 386.
Sprague, H. B., 482, 619.
Sprague, R., 74, 350, 351, 641.
Sprague, T. A., 596.
Sproule, W. H., 241.
Spruyt, J. P., 416.
Spyker, F. B., 432.
Squire, F. A., 223.
Srivastava, H. D., 254.
Stabler, R. B., 478.
Stadler, L. J., 185.
Stafseth, H. J., 255.
Stahel, G., 80.
Stahl, A. L., 624.
Stahmann, M. A., 344.
Stakman, E. C., 41, 206, 345, 346, 503, 719.
Stålfelt, M. G., 32, 33.
Stalwick, A. E., 37.
Stamberg, O. E., 9, 294, 411, 442.
Stanford, G. W., 748.
Staniewicz, W., 703.
Stanley, E. B., 806.
Stanley, W. M., 204, 345, 745.
Stansel, R. H., 37.
Stanton, E. F., 665.
Stanton, T. R., 53, 766.
Stapel, C., 527.
Staple, W. J., 446.

Stapp, C., 346.
Starch, E. A., 405.
Stark, F. L., Jr., 173.
Starkey, L. V., 529.
Starkey, R. L., 468.
Starkey, W. F., 45, 328, 613.
Starr, D., 583.
Starr, S. H., 718.
Steanson, O., 693.
Stearns, L. A., 85.
Steavenson, H. A., 632.
Steck, W., 822.
Stedbronsky, V. L., 831.
Steenbock, H., 95, 126, 129
Steggerda, M., 700.
Steinbach, M. M., 822.
Steinbauer, C. E., 458.
Steinberg, R. A., 38, 177, 456, 468.
Steiner, G., 780, 782, 821.
Steiner, H. M., 367.
Steiner, J. F., 699.
Steiner, L. F., 216, 658.
Steininger, G., 708, 848.
Steinmetz, F. H., 68.
*Stene, A. E., 719.*
Stephens, E., 267.
Stephens, J. C., 42, 485.
Stephenson, D., 822.
Stepp, W., 425.
Stern, K. G., 462, 731.
Stevens, F. D., 616.
Stevens, H., 470.
Stevens, H. E., 358.
Stevens, J. L., 616.
Stevens, N. E., 201, 350, 643.
Stevens, O. A., 287, 488, 863.
Stevens, R. D., 64.
Stevens, R. H. W., 57, 58, 61, 599.
Stevens, W. C., 168.
Stevenson, D. D., 779.
Stevenson, J. A., 68, 201, 502, 783.
Stevenson, M. M., 856.
Steward, F. C., 320.
Stewart, D. F., 397.
Stewart, G., 50, 483.
Stewart, J., 250, 399, 681.
Stewart, J. D., 424.
Stewart, M. A., 249, 826.
Stewart, R., 448.
Stewart, S., 187.
Stewart, W. S., 172, 461.
Stieferman, M. A., 168.
Stienbarger, M. C., 136.
Stier, H. L., 201, 627.
Stiles, G. W., 252, 253, 395.
Stiles, W., 748.
Stimson, C. R., 277.
Stine, J. B., 103.
Stitts, T. G., 387, 839.
Stoa, T. E., 55, 481.
Stockelbach, L. S., 293.
Stoddard, E. M., 652.
Stoddard, M. P., 297.
Stoddart, L. A., 258, 430, 763.
Stoeckeler, J. H., 342, 499.
Stoehr, J. A., 179.
Stokes, F. R., 244.
Stokes, J. L., 26, 312.
Stokes, W. E., 616.
Stokstad, E. L. R., 383, 812.
Stoll, N. R., 246, 395, 821.
Stoltz, E. J., 95.
Stone, C. P., 477.
Stone, E. L., 342.
Stone, M. W., 91.
Stone, P. C., 517.
Stone, R. W., 100, 675.
Stone, W. S., 542.
Storey, H. H., 345.
Stormer, V., 95.
Stout, A. B., 595.
Stout, G. J., 773.
Stout, P. R., 456.
Stout, R. E., 391.
Stoutemyer, V. T., 498.
Strachan, C. C., 194.
Strain, H. H., 601.
Strand, E. G., 836.
*Strandskov, H. H., 180.*
Strangeways, W. I., 821.
Strauss, L. H., 716.
Street, O. E., 485, 486.
Stroman, G. N., 619.
Strong, F. M., 6, 95, 101.
Strong, L. A., 83.
Strong, L. C., 183.
Strong, T. H., 463.
Strugger, S., 599.
Struthers, D. K., 549.
Strzemienski, J. K., 864.
Stuart, H. O., 399.
Stubbs, E. L., 253, 544.
Studholme, A. T., 793.
Stunkard, H. W., 821.
Sturgis, C. C., 413.
Sturgis, M. B., 7.
Subbarow, Y., 568, 848.
Subramaniam, T. V., 222.
Sudds, R. H., 491.
Sueyoshi, Y., 570.
Sulkin, S. E., 394.
Sullivan, M. X., 72.
Sullivan, R. A., 152.
Sullivan, W. N., 372, 520.
Sumida, D., 479, 488.
Sumner, J. B., 297.
Summers, E. M., 505.
Sump, A. W., 499.
Suneson, C. A., 503, 652, 754, 756.
Supplee, G. C., 445.
Sure, B., 127.
Sutcliffe, R. C., 158.
Sütö-Nagy, G. de, 613.
Sutton, T. S., 184, 675.
Svendsen, L., 387.
Sverdrup, H. U., 19.
Sveshnikova, N. M., 362.
Svirbely, J. L., 853.
Swaby, R. J., 28.
Swain, A. F., 89.
Swales, W. E., 248, 821.
Swallen, J. R., 40, 597.
Swallow, R. L., 594.
Swanback, T. R., 485.
Swaney, M. W., 243.
Swank, G. R., 83, 663.
Swanson, A. M., 101, 392.
Swanson, C. O., 294, 295.
Swanson, C. P., 464.
Swanson, E. W., 608.
Swanson, G. A., 363.
Swanson, H. E., 82.
Swanson, L. E., 250, 398, 543, 825.
Swartwout, H. G., 180, 217, 631.
Sweet, R. D., 773.
Sweetman, M. D., 333.
Swenk, M. H., 87, 519, 662.
Swenson, G. A., 593.
Swenson, S. P., 754.
Swett, W. W., 608, 674, 815.
Swezey, J. A., 552.
Swift, F., 468.
Swift, R. W., 807.
Swingle, C. F., 454.
Swingle, M. C., 92.
Swingle, W. T., 40.
Swisher, I. G., 861.
Sydenstricker, V. P., 714.
Sykes, J. F., 675, 807.
Symons, T. B., 288.
Syverton, J. T., 820.

Tabakoff, I. J., 386.
Tage-Hansen, E., 285.
Tait, G. W. C., 738.
Takahashi, M., 479, 488, 764.
Takahashi, W. N., 71.
Takamine, N., 460.
Talbert, T. J., 185, 189, 194.
Taliaferro, W. H., 41, 821.
Talley, P. J., 779, 781.
Tannehill, I. R., 158.
Tannor, B., 381.
Tapley, W. T., 185, 191.
Tarassuk, N. P., 240.
Tarkow, L., 126.
Tasker, H. S., 795.
Tate, H. D., 87, 662.
Tatum, A. L., 108.
Taylor, A. L., 780, 782.
Taylor, A. R., 399.
Taylor, A. W., 681, 823, 824.
Taylor, C. A., 495.
Taylor, C. C., 123, 555.
Taylor, E. L., 396, 821.
Taylor, G. R., 405.
Taylor, H. C., 115, 404, 834.
Taylor, J. W., 351.
Taylor, L. W., 386, 475, 476.
Taylor, M. W., 672.
Taylor, R. D., 283, 744.
Taylor, S., 274.

Tazima, T., 105.
Tehon, L. R., 215, 360, 518.
*Teik, G. L., 793, 794.*
Telford, H. S., 92.
Temple, C. E., 201, 864.
Templeton, G. S., 388.
*TenBroeck, C., 819.*
Tennant, J. L., 406.
Tenny, L. S., 387.
Tepper, A. E., 805.
*Terho, T., 475.*
Terrill, C. E., 178, 179.
Teske, A. H., 799.
Tetreau, E. D., 557.
Thacker, E. J., 807.
Thaden, J. F., 409.
Thaller, H. I., 677.
Tharp, W. E., 306.
Tharp, W. H., 47, 68.
Thayer, C. L., 771.
Thayer, J. W., 53.
Thayer, S. A., 13, 15, 16, 586, 733, 734, 737, 857.
Theophilus, D. R., 391.
Thiele, W., 417, 709.
Thies, W. H., 517, 771.
Thiessen, E. J., 411.
Thimann, K. V., 455, 460.
Thiroux, A., 425.
Thistle, M. W., 199.
Thjötta, T., 822.
*Thom, C., 39, 177, 456.*
Thomas, B. H., 96, 380.
Thomas, E. L., 802.
Thomas, Harvey E., 79, 80, 213.
Thomas, J., 467.
Thomas, K. M., 211.
Thomas, L. J., 821.
Thomas, R. C., 645.
Thomas, R. M., 823.
Thomas, W. A., 828.
Thomas, W. P., 406.
Thompson, A. T., 542.
Thompson, B. G., 795.
Thompson, D. L., 102.
Thompson, G. E., 40.
Thompson, H. E., Jr., 413.
Thompson, H. J., 35.
Thompson, L. S., 864.
Thompson, R. B., 257, 812.
Thompson, W. C., 389, 390.
Thompson, W. L., 650.
Thompson, W. S., 559.
Thompson, W. W., 542.
Thomsen, A., 142.
*Thomsen, F. L., 387, 834.*
Thomsen, L. C., 100, 102.
Thomson, C., 120.
Thomson, D. L., 184.
Thomson, H. J., 190.
Thomson, K. B., 437.
Thornberry, H. H., 510.
Thorne, D. W., 40.
Thorne, G., 82, 354, 649, 797.
Thornthwaite, C. W., 19.
Thorp, F., Jr., 243, 249, 255, 545, 575.
*Thorvaldson, T., 727.*
Thullbery, H. A., 358.
Thurber, F. H., 231.
Thurston, H. W., Jr., 636.
*Thurston, L. M., 431.*
Tiedjens, V. A., 175, 193.
Tiegs, O. W., 523.
Tiffany, H. S., 771, 783.
Timberlake, P. H., 93, 804.
Tindale, G. B., 494.
Tinney, F. W., 472.
Tisdale, H. B., 781.
Tisdale, W. B., 78, 634, 782.
Tiselius, A., 455, 466.
Tissot, A. N., 650.
Titus, H. W., 97, 386, 587.
Toben, G. E., 690.
Tobey, E. R., 344.
Tobey, J. A., 418.
Tobler, F., 468.
Todd, A. R., 280.
*Todd, W. R., 725.*
Todhunter, E. N., 268, 544.
Toit, P. J. du, 425.
Tolksdorf, S., 45.
*Tolley, H. R., 693.*
Tolman, T. G., 302.
Tombave, A. E., 94.
Tomlinson, W. E., Jr., 370, 796.
Tompkins, C. M., 72.
Tompkins, L. J., 825.
Tonutti, E., 418.
Tooke, F. G. C., 222.
Toole, E. H., 487, 764.
Toole, V. K., 54, 487, 764.
Topping, N. H., 395.
Tordt, T., 429.
Toro, E. del, Jr., 689.
Toro, G. del, Jr., 739.
Torres, R. C., 689.
Torrie, J. H., 74.
Tottingham, W. E., 173, 333, 456.
Townley, R. C., 540.
Townsend, C. T., 155.
Townsend, G. F., 222.
Townsend, G. R., 624, 634.
Townsend, J. F., 652.
Tracy, P. H., 241, 242, 393, 539, 672, 673.
Trägårdh, I., 218.
Trager, W., 254.
Tranmal, H., 101.
*Traub, E., 820.*
Trautman, M. B., 515.
Travis, G., 168.
Trent, J. A., 214.
Tressler, C. J., 301.
Tressler, D. K., 277, 456, 701, 772, 848.
Trimberger, G. W., 608.
Trimble, H. C., 179.
Tripp, F., 282.
Troncoso, M. P., 123.
Trout, G. M., 101, 539, 816.
*Troutman, M. C., 726.*
Trowbridge, E. A., 182, 229.
True, R. P., 81.
Truog, E., 161, 306, 335, 451.
*Truran, W. E., 771, 783.*
Tsao, C. P., 412.
Tschuprow, A. A., 430.
Tsivenko (Tzivenko), I., 784.
Tuck, J. B., 367.
Tucker, C. M., 78, 201, 202, 502, 512.
Tucker, H. H., 101.
Tuckey, S. L., 102, 673, 674.
Tukey, H. B., 194, 775.
Tukker, J. G., 387.
Tulaganov, A. T., 362.
Tullis, E. C., 68.
Tully, R. H., 3rd., 281.
Turk, K. L., 675.
Turner, C. D., 329.
Turner, C. W., 44, 47, 179, 182, 238, 328, 608, 759.
Turner, N., 652.
Turner, T. B., 822.
Turnipseed, G. F., 519, 794.
*Turpeinen, O., 707.*
Turrell, F. M., 745.
Turrill, W. B., 595.
Tuschak, N., 385.
Tuttle, A. P., 771.
Twenhofel, W. H., 161.
Tyler, C., 811.
Tyler, J., 780, 782.
Tyler, M. E., 674.
Tytell, A. A., 467.

Uber, F. M., 726.
Udy, W. H., 103.
Uffelen, J. L. van, 701.
Uhl, W. L., 699.
Uichanco, J. B., 251.
Umbreit, W. W., 467, 469.
Underbjerg, G. K. L., 608.
Underhill, G. W., 221.
Underhill, S. W. F., 297.
Underwood, J. K., 481.
Unna, K., 568.
Upholt, W. M., 83, 86.
Uppal, H. L., 24.
Upshall, W. H., 196.
*Ussery, H. D., 506.*
Ustinov, A. A., 362.
Usuelli, F. 386.
Utermohlen, W. P., Jr., 456.
*Utley, E., 564.*
Utter, M. F., 607.

Valle, J. E., 56, 126.
Valentine, J. M., 523.
Valleau, W. D, 354, 635, 643, 783.
van Alstyne, L. M., 198.
Van Atta, G. R., 82.
Vance, R. B., 405.

*Van Cleave, H. J., 821.*
Vandecaveye, S. C., 160.
Vandenbelt, J. M., 736.
Van Donk, E., 126.
Van Dyke, H. B., 329.
van Eekelen, M., 707.
Van Es, L., 546.
*Van Heuverswyn, J., 44.*
Van Horn, A. G., 676.
VanLandingham, A. H., 153, 673.
Van Lanen, J., 344.
Van Leeuwen, E. R., 90, 367
van Loghem, J. J. 466.
*Van Meter, R. A., 771.*
Van Niel, C. B., 467.
Van Orden, H. O., 719.
Van Overbeek, J., 318, 461.
Van Roekel, H., 823.
Van Sant, H., 822.
Vansell, G. H., 217, 303, 379.
Vanterpool, T. C., 640.
Van't Hoog, E. G., 418.
van Uffelen, J. L., 701.
Van Veen, A. G., 703.
Van Vlack, C. H., 549.
Van Wagenen, A., 388.
Van Zwaluwenburg, R. H., 525.
Varney, R., 612.
Vaughan, E. K., 212.
Vavilov, N. I., 596.
Vawter, L. R., 540.
Vaz, Z., 400.
Vedhuis, M. K., 436.
Veerhoff, O., 436, 620.
Vehrs, H., 330.
Velez, I., 745.
Vélez, M., Jr., 689.
Venstrom, C., 692.
Ventre, E. K., 583.
Verderevskii (Verderevsky), D. D., 784.
Verdina, C., 822.
Verdoorn, F., 720.
Verlot, J. B., 701.
Vermes, M., 416.
Vernon, A. A., 6.
Verona, O., 641.
Vertogradova, O. N., 784.
Vial, E. E., 556.
Vickery, H. B., 438, 584, 745.
Vidgoff, B., 330.
Viennot-Bourgin, G., 223.
Vieth, E. L., 756.
Vilter, R. W., 420, 858.
Vilter, S. P., 420, 858.
Vincent, C. L., 185, 190, 628, 786.
Vinet, E., 223.
Vinson, C. G., 189, 202, 217, 659.
Virgin, W. J., 78, 511.
Virtanen, A. I., 468.
Virtue, M. E., D., 667.
Virtue, R. W., 667.
*Vogel, F. H., 864.*
Vogel, O. A., 185, 202.
Volin, L., 263.
Volk, G. W., 307.
Volk, N. J., 24, 163.
Volker, J. F., 572.
Voorhees, R. K., 634.
*Voris, L., 301.*
Voth, P. D., 304.
Vreeland, J., 725.
Vries, J. B., 387.

Waddell, W. H., 639.
Waddington, C. H., 47.
*Wade, B. L., 178.*
Wade, J. S., 514.
Wade, N. J., 45, 845.
Wadleigh, C. H., 47.
Wadley, F. M., 804.
Wadsworth, C. K., 16, 17
Wadsworth, G. P., 469.
*Wadsworth, H. A., 552.*
Wadsworth, S. E., 190.
Wagenen, A. Van, 388.
Wagner, A., 37.
Wahl, H., 713.
Wain, R. L., 212.
Waisman, H. A., 95, 126.
*Waisman, K. A., 276.*
Wakeland, C., 368.
Wakeman, A. J., 584.
Waksman, S. A., 231, 456, 467, 606.
Wald, G., 131.
Waldmann, O., 820.
Waldron, A. F., 499.
Walker, A. H., 808.
Walker, E. A., 201.
Walker, H. G., 368, 369.
Walker, J., 59.
Walker, J. C., 79, 333, 344, 346, 352, 511.
*Walker, J. E., 864.*
Walker, L. S., 666.
Walker, M. E., 229.
Walker, M. G., 228.
Walker, M. N., 634, 780.
Walker, R. H., 288.
Walker, R. I., 171.
Walker, R. V. L., 108.
Wall, J. F., 235.
Wall, M. E., 174, 175, 193, 598.
Wall, R., 231, 668.
Wallace, B. A., 407.
Wallace, H. A., 3, 555.
Wallace, J. M., 643.
Wallace, P., 652.
Wallace, R. W., 480.
Wallace, W. G., 342.
Waller, E. F., 791.
Wallihan, E. F., 200.
Wallis, G. C., 675.
Wallrabenstein, P. P., 406, 688.
Wallraff, J., 418.
Walls, E. P., 627.
Walsh, F. E., 239.
Walster, H. L., 49.
Walter, J. M., 790.
Walton, C. F., Jr., 583.
Walton, J. H., 8.
Walton, S. T., 542.
*Wampler, E. L., 83.*
Wang, H., 331.
Wang, Y. L., 851.
Wann, F. B., 357.
Warbritton, V., 182.
Ward, A. R., 100.
Ward, R. E., 99, 719.
*Ward, W. E., 143.*
Ward, W. F., 665.
Wardlaw, C. W., 777.
Ware, J. O., 480, 745, 781.
Warner, J. D., 616.
Warren, C., 615.
Warren, C. C., 387.
*Warren, D. C., 44, 327.*
Warwick, B. L., 184, 756.
Washbourn, R., 222.
Washburn, L. E. 238.
Washburn, R. S., 691.
Washko, J. B., 333.
Wassén, A., 822.
*Wasser, C. H., 186.*
Wasson, A. J., 674.
Wasson, D. E., 864.
Waterman, A. M., 343, 500.
Waterman, H. I., 468.
Watkins, G. M., 502, 780, 781.
Watkins, J. V., 624.
Watkins, K. S., 606.
Watkins, M. O., 352, 502, 780, 781.
Watrous, R. M., 677.
Watson, A. E., 405, 694.
Watson, C. J., 242, 383.
Watson, E. A., 41.
*Watson, H. M. S., 613.*
Watson, I., 235, 808.
Watson, J. R., 519, 634, 650.
Watson, S. J., 233.
Watts, B. M., 268.
Watts, J. G., 519.
Watts, P. S., 683.
Watts, V. M., 56, 626.
Waugh, F. V., 405, 834.
Waxler, S. H., 105.
Wayne, J., 126.
Weakley, C. E., Jr., 673.
Weathers, E. K., 436.
Weaver, F. P., 864.
Weaver, J. E., 66, 504.
Weaver, J. W., 714.
Weaver, L. A., 229.
Webb, B. H., 674.
Webb, J., 168.
Webb, J. E., Jr., 658.
Webb, J. L., 317.
Webb, J. M., 519.
Weber, G. F., 634, 644.
Webrew, J. A., 456.

Webster, L. T., 476, 820.
Webster, O. J., 617, 622, 768.
Webster, R. L., 217, 367.
Weckel, K. G., 101, 102.
Weech, A. A., 128.
Weedon, H. W., 701.
Weeks, O. B., 607.
Weetman, L. M., 53, 68, 639.
Wegner, M. I., 95, 382.
Wehmeyer, L. E., 596.
Wehrle, L. P., 93, 220.
Weichselbaum, T. E., 726.
Weidman, F. D., 821.
Weidman, R. H., 65.
Weigel, C. A., 216, 652.
Weihing, R. M., 186, 189, 863.
Weil, L., 467.
Weiland, G. S., 371.
Weiland, G. W., 363.
Weimer, J. L., 76, 780, 782, 786.
Weinberg, M., 823.
Weindling, R., 504, 636, 780, 782.
Weingard, A. B., 520.
Weinstock, H. H., Jr., 531.
Weiser, H. H., 674.
Weiss, F., 80, 201, 359, 360, 362, 500, 635 636, 782, 783.
Weiss, H. A. von, 218.
Weiss, H. B., 227.
Weissgerber, F., 387.
Welch, D. S., 502.
Welch, H., 246, 397.
Welch, J. E. 479, 488, 500.
Welden, W. C., 839.
Welles, S., 2.
Wellington, R., 341, 495, 775.
Wellman, F. L., 212.
Wellman, H. R., 692, 840.
Wellman, R., 202.
Wellman, R. H., 636.
Wells, H. E., 234, 681.
Wells, J. A., 331.
Wells, J. G., Jr., 98, 536.
Wells, O. V., 405.
Wenckebach, K. F., 425.
Wenger, L. E., 764.
Went, F. W., 172, 346.
Wentz, J. B., 50.
Werkman, C. H., 6, 467, 469, 607, 608, 725.
Werner, G. M., 42.
Werner, H. O., 766.
Wernham, C. C., 785.
Wertz, A. W., 843.
Wessels, P. H., 57.
West, E., 502, 634, 677.
West, E. S., 725.
West, P. M., 6, 468.
Westcott, C., 500.
Wester, R. E., 489.
Westerdijk, J., 467.
Westerlund, A., 701.
Westfall, J. J., 315.
Westgate, W. A., 55.
Whaley, W. G., 753.
Wharton, E. H., 717.
Wheeler, H. G., 428.
Wheeler, L. A., 387.
Wheeler, M. E., 553, 834.
Wheeler, R. H., 739.
Wheeler, S. S., 381.
Wheeting, L. C., 160, 190, 454.
Whelan, D. B., 516, 519.
Whelden, R. M., 457.
Whetstone, R. R., 166.
Whatzel, H. H., 646, 782.
Whipple, G. H., 572.
Whipple, O. C., 344.
Whistler, R. L., 860.
Whitaker, R., 260.
Whitaker, T. W., 355.
Whitcomb, W. D., 370, 517, 796.
Whitcomb, W. O., 623.
White, D. P., 342.
White, H. A., 551.
White, H. E., 771.
White, H. J., 822.
White, J. J., 201.
White, O. H., 692.
White, P. R., 321.
White, R. T., 226, 374, 375.
White, W., 539.
White, W. H., 216.
Whitehead, M. R., 606.
Whiteman, E. F., 768.
White-Stevens, R. H., 57, 58, 61, 599.
Whitfield, C. J., 687.
Whiting, G. C., 747.
Whitlock, C., 863.
Whitlock, J. H., 244, 254.
Whitmire, H. E., 793.
Whitmore, B. F., 103.
Whitney, L. F., 541.
Whitney, R., 612.
Whittier, E. O., 100.
Whittington, F. B., 373, 374.
Whittles, C. L., 449.
Whyte, R. O., 603.
Wiant, J. S., 343, 512.
Wick, H. J., 45.
Widdowson, E. M., 414, 415.
Widenbauer, F., 439, 712.
Widland, M. A., 814, 819.
Wiegand, E. H., 155, 583.
Wierzchowski, P., 28.
Wiese, A. C., 95, 727.
Wiggert, W. P., 607.
Wight, A. E., 677.
Wight, W. F., 196.
Wigodsky, H. S., 758.
Wiig, S. B., 202.
Wiklander, L., 23.
Wilbur, D. L., 425, 848.
Wilbur, J. W., 608, 675.
Wilcox, J., 91.
Wilcox, J. C., 454.
Wilcox, L. V., 314.
Wilcox, M. S., 357.
Wilcox, P. A., 805.
Wilcox, R. B., 357.
Wilcox, W. W., 115.
Wilcoxon, Frank, 521, 527.
Wilcoxon, Fredericka, 521.
Wilde, E. I., 64, 778.
Wilde, S. A., 342, 633.
Wilder, R. M., 425.
Wiley, W. J., 103.
Wilgus, H. S., 386.
Wilhelm, L. A., 98, 229, 386, 388, 534, 719.
Wilkins, W. H., 603.
Wilkinson, H., 571.
Willard, H. S., 676.
Willett, E. L., 757.
Williams, B. O., 841.
Williams, C. B., 222.
Williams, D. E., 530.
Williams, D. W., 178.
Williams, J. K., 547.
Williams, K. T., 543.
Williams, L. R., 748.
Williams, N. K., 178.
Williams, P. S., 814, 831.
Williams, R. J., 468, 668.
Williams, V. R., 720.
Williams, W. L., 243.
Williams, W. R. L., 356.
Willis, E. R., 803.
Willis, L. G., 748.
Willis, R. L., 193.
Willis, W. P., Jr., 167.
Willits, C. O., 156, 301.
Willman, J. P., 756, 809.
Willstaedt, H., 707.
Wilmot, R. J., 624, 650.
Wilsie, C. P., 764, 765.
Wilson, C. A., 673.
Wilson, C. P., 590.
Wilson, C. V., 283.
Wilson, D. C., 706.
Wilson, D. R., 407, 820.
Wilson, D. W., 588.
Wilson, G. B., 753.
Wilson, H. F., 87, 364, 516.
Wilson, H. K., 430.
Wilson, H. L., 818.
Wilson, I. C., 123, 142.
Wilson, J. D., 20, 75, 210, 511, 788.
Wilson, J. W., 650, 651, 756, 798.
Wilson, M., 862.
Wilson, M. L., 404.
Wilson, P. W., 6, 468.
Wilson, R. H., 426.
Wilson, S. A., 699.
Wilson, S. D., 412.
Wilson, W. O., 671.
Wilson, W. T., 115.
Wilster, G. H., 301, 391.
Winchester, C. F., 672.
Windle, W. F., 328.
Winegar, A. H., 382, 582.
Winkjer, J. G., 238.

Winkler, C. H., Jr., 105.
Winn, H. H., 672.
Winn, L. J., 860.
Winsor, H. W., 581, 592, 699.
Winston, J. R., 137, 496, 510.
Winter, A. R., 254.
Winter, H. F., 356.
Winter, J. D., 495.
Winterkorn, H. F., 453.
Winternitz, M. C., 823.
Winton, B., 678.
Wintrobe, M. M., 96.
Wipf, L., 333.
Wise, G. H., 238, 535, 675.
Wiseman, H. G., 675.
Wiseman, L. L., 745.
Wiseman, R. C., 387.
Wisnicky, W., 42, 95, 105.
Withiam, C. G., 211.
Wittenkamp, R., 342.
Woelffer, A., 282.
Woessner, W. W., 411.
Woglum, R. S., 87.
Wohl, K., 602.
Wolcott, G. N., 83, 651, 652.
Wolf, F. A., 70, 72, 214, 506, 648.
Wolf, H. W., 141, 573.
Wolf, M., 456.
Wolfe, G. E., 40.
Wolfe, J. M., 46, 47.
Wolff, E. T., 432.
Wollenweber, H. W., 468.
Wollman, E., 345.
Wolman, W., 438.
Wood, H. G., 467, 469.
Wood, J. F., 627, 772.
Wood, J. I., 201.
Wood, M., 375.
Woodbridge, C. G., 451.
Woodburn, R., 20.
Woodbury, E. N., 520.
Woodman, H. E., 810.
Woodman, R. M., 336, 490, 627.
Woodmansee, C. W., 432.
Woodroof, J. G., 153.
Woodruff, H. B., 456.
Woodruff, L. C., 219.
Woods, J. J., 193.
Woods, M. W., 210.
Woodward, T. E., 381, 383.
Woolbert, R. L., 410, 575.
Wooley, J. C., 159, 229, 255, 256.
Woolley, D. W., 95, 126, 437, 467, 567.
Woolpert, O. C., 819.
Work, C. E., 280, 711.
Work, S. H., 382, 528, 808.
Worley, C. L., 746.
Worthley, H. N., 367.
Worzella, W. W., 770.
Woytinsky, E. S., 115.
Woytinsky, W. S., 115.
Wrenshall, C. L., 452, 455.
Wright, A. W., 47.
Wright, J. W., 693.
Wright, L. D., 667, 669.
Wright, L. E., 349.
Wright, L. K., 207.
Wright, M. D., 419.
Wright, N., 725.
Wright, R. C., 225, 774.
Wright, S., 178, 754.
Wright, T., Jr., 594.
Wright, V. A., 144.
Wu, S.-K., 325.
Wuhrmann, F., 285.
Wurm, M., 615.
Wyburn, G. M., 757.
Wylie, C. E., 391, 673, 675.
Wylie, W. D., 659.
Wynd, F. L., 189.

Yagodkina (Jagodkina), V. N., 784.
Yakimovich (Yakimowich), E. D., 784.
Yale, M. W., 241.
Yamashita, J., 678.
Yang, E. F., 279, 426, 704.
Yang, J. Y., 209.
Yanovsky, E., 10, 231.
Yap, F., 649.
Yarbrough, M., 854.
Ybarra, R. A., 5.
Yeager, A. F., 490, 771.
Yegian, H. M., 740, 771.
Yeh, H. L., 273.
Yerkes, G. E., 491.
Yetter, W. P., Jr., 371.
Yongue, N. E., 538.
York, H. A., 48, 479.
Yorke, W., 821.
Yoshida, R., 448.
Yoshikawa (Yosikawa), M., 678, 682.
Yost, T. F., 770.
Yothers, M. A., 367, 652.
Youden, W. J., 746, 749.
Young, A., 540.
Young, A. E., 50.
Young, E. C., 263, 405.
Young, F. G., 100.
Young, H. C., 78, 209, 356, 360, 463.
Young, H. D., 217.
Young, H. Y., 322, 584.
Young, M. R., 395.
Young, P. A., 177, 213, 352, 500, 780, 782, 788.
Young, R. E., 771.
Young, S. P., 215.
Young, V. A., 215.
Young, V. H., 68, 637.
Youngburg, G. E., 443.
Younge, O. R., 22.
Yourga, F., 725.
Yü, H. H., 273.
Yu, T. F., 69.
Yuan, L. C. L., 446.
Yung, F. D., 114.

Zahl, P. A., 517.
Zapp, J. A., Jr., 588.
Zappe, M. P., 651, 652.
Zaumeyer, W. J., 178, 645.
Zazhurilo (Sajurilo), V. K., 784.
Zentmyer, G. A., Jr., 288.
Zia, Y., 224.
Ziffren, S. E., 423.
Zijlstra, K., 605.
Zimmerley, H. H., 30, 627, 772.
Zimmerman, P. W., 455, 468, 750.
Zimmerman, W. I., 456.
Zink, N. E., 591.
Zinsser, H., 677.
Zoch, R. T., 446.
Zondek, S. G., 562.
Zuber, M. S., 50, 51.
Zuckerman, S., 615.
Zumbro, P. B., 387.
Zundel, G. L., 204, 502.
Zwemer, E. A., 429.

# INDEX OF SUBJECTS

NOTE.—The abbreviations "Ala.", "Conn.[New Haven]", "Mass.", etc., after entries refer to the publications of the respective State experiment stations; "Hawaii" and "P.R." to those of the experiment stations in Hawaii and Puerto Rico; "Can." to those of the experiment stations in Canada; and "U.S.D.A." to those of this Department.


Abaca bacterial wilt, nature, and pathogenicity tests, 351.
*Abies* spp., diseases of, revised check list, U.S.D.A. 201.
Abortion—*see also Brucella abortus.*
- control from standpoint of animal breeder, 677.
- control in experimental herd of range cattle, 246.
- control in Western States, problems in, 677.
- Federal-State program, status, 677.
- field immunization experiments with vaccine from strain 45, 106.
- in army stud farm, role of mineral deficiency in, 250.
- in ewes, Wyo. 541.
- in sheep, excretion of *Brucella melitensis* following, 105.
- report of committee on, 677.
- tests for determining in dairy cattle, N.J. 677.
- transmission from swine to cattle, Mo. 242.
- tube agglutination and plate tests on low reacting serums in, comparison, Mo. 242.
- vaccinated heifers in an infected herd, report, 542.
- virus, in mares, Ky. 540.
- virus, of mares, diagnosis, 399.

*Abutilon* through *Aleurites,* host-parasite check list revision, 635.
*Acacia,* species, histogenesis and morphology of phyllode in, 170.
Acanthocephala, relations of, 821.
*Acediopsylla,* new subgenera, erection, 525.
*Acer* section of revised plant disease check list, U.S.D.A. 500.
Acetic acid, antiseptic action, Mass. 725.
Acetonemia in swine, 684.
Achromotrichia—
- in piebald rats, fractionation of factor preventing, 382.
- nutritional, 567.

*Achyla ambiscaualis,* sex hormones in, 318.
Acid phosphate, *see* Superphosphates.
Acids—
- amino, *see* Amino acids.
- fatty, *see* Fatty acids.

*Acmaeodera*—
- *palmarum* n.sp., description, 93.
- *perlanosa* n.sp., description, 93.

*Acorduleceros megacephalus*—
- n.sp., description, 228.
- notes, 228.

Acrididae—
- geographic distribution, in northern Oklahoma, 523.
- of northeastern Texas, key, 797.

Acridine derivatives, mode of action, 822.
*Acrobasis caryae, see* Pecan nut casebearer.
*Acrospermoides,* new genus erection, 40.
*Acrotelium* genus, new taxonomy for, 204.
*Actinomyces*—
- and allied organisms, classification basis, 467.
- cause of sweetpotato soil rot, 783.
- *cellulosae* inoculated into sterilized soil, survival, 27.
- nuclei in, 752.
- population of soils, N.J. 598.
- *scabies,* races, variation in tolerance to pH, 642.
- taxonomic notes, 607.
- thermophilic autolysis of, 28.

Actinomycetales, structure, development, and classification, 467.
Actinomycetes, classification, 467, 606.
*Adelopus gaumanni,* cause of needle-cast of Douglas fir, 647.
Adenylic acid and nicotinamide as substitute for yeast filtrate or yeast eluate factors, 711.
Adrenal—
- cortex hormones, role in lactation in guinea pigs, Mo. 182.
- glands, hemorrhagic necrosis in rats on deficient diets, 139.

*Aecidium* new species, 636.
*Aedes thibaulti,* studies, Ark. 84.
*Aeolus*—
- *dorsalis,* notes, Ky. 518.
- *mellillus,* injurious to tobacco, Ky. 376.

*Aenasius paulistus*, parasite of *Pseudococcus maritimus*, 83.
*Aeolothrips melaleucus*, seasonal history on hops, 85.
*Aerobacter aerogenes*, acetylmethylcarbinol enzyme-system of, 608.
*Aerobacter* spp., preparation of an active juice from, 607.
*Aglossa cuprealis*, new pest of tobacco, N.J. 651.
Agnathia, new type in an Ayrshire calf, 188.
Agouti, golden-rumped, unrecorded form of nematode from, 522.
Agricultural—
Adjustment Administration, Division of Marketing and Marketing Agreements, report, U.S.D.A. 122.
and home economics education, papers, 698.
census, first world, 694.
census of 1940, 405.
colleges—see also specific colleges.
organization lists, U.S.D.A. 559.
Commodities Act, Perishable, digest of decisions of Secretary of Agriculture under, U.S.D.A. 122.
conservation—
and efficient production, measures needed to achieve, 115.
programs in Illinois, operation, U.S.D.A. 690.
program in Licking County and surrounding counties, Ohio 551.
control, wartime, in Germany, U.S.D.A. 263.
cooperation, inter-American, U.S.D.A. 555.
cooperation, yearbook, 407.
credit—
conditions in Aroostook County, Me. 405.
from production credit associations and commercial banks, cost of, S.C. 551.
short-term, in South Carolina, S.C. 837.
short-time, used by plantation operators, owners, and tenants in cotton area, Ark. 116.
economic personnel, training and recruitment of, 834.
economics—
early history, 404.
levels of training for service in, La. 689.
personnel training and recruitment in, 404.
place in program of development for the South, 836.
training for work in, nature and scope, 404.
economist, theoretical equipment, needed additions to, 404.
education and research, closer inter-American relations in, editorial, 289.
Agricultural—Continued.
education, vocational, organization and administration, 698.
experiment stations, see Experiment stations.
extension, see Extension.
journals, changes in, 720.
labor—
and Fair Labor Standards Act of 1938, 834.
impact of industrial, labor, and agricultural control policies, 124.
migratory in Western States, 841.
requirements and supply of Kern County, Calif. 691.
sharecroppers and wage laborers, shift in tenure status of, S.C. 838.
since 1920, 115.
supply and demand, Ohio 689.
legislation, international yearbook, 552.
machinery for pea weevil control, Idaho 549.
machinery, rubber-tiring, Iowa 549.
marketing service, acts administered by, U.S.D.A. 834.
measures, wartime, of Canada, U.S.D.A. 555.
planning, county project, 405.
policy, 834.
policy, foreign, recent developments in, U.S.D.A. 120.
policy, national, changes needed for the South, 405.
policy, place of farmers, economists, and administrators in developing, 404.
policy of Canada, wartime, U.S.D.A. 120.
population, trend in, Colo. 863.
press, international directory, 430.
price statistics in United States and abroad, 115.
prices, control, in United Kingdom, U.S.D.A. 555.
production—
and types of farming in Minnesota, Minn. 689.
and types of farming, statistical supplement, Minn. 690.
plans, changes in and reason, Wis. 117.
products—
cost of production, see specific crops.
gross cash income from and Government payments, 406, Ohio 6_9.
indexes of prices, demand deposits, and purchasing power, Okla. 405.
marketing, see Marketing.
prices, of North Dakota, N.Dak. 553.
regional prices received for, in Tennessee and United States, Tenn. 553.
State laws limiting competition in, 405.

Agricultural—Continued.
products—continued.
transportation in United States, U.S.D.A. 263.
world trade in, growth, crisis, and new policies, 695.
relief, *see* Relief.
research—*see also* Research.
in Puerto Rico, economic background for, P.R.Col. 835.
quantitative spectrographic methods for development, Fla. 581.
sampling, new developments in, 405.
situation, Okla. 405, 689.
situation, world, 694.
statistics—
century of, 115.
development, close-up view, 115.
development in Bureau of Census, 115.
future improvement in, 115.
progress in world, 115.
surpluses and nutritional deficits, 405, 693.
surpluses, programs for use to reduce malnutrition and to benefit farmers, 405.
surveys, experiment in design of, 115.
tenancy, *see* Farm tenancy *and* Farm tenure.
Agriculture—
American, war adjustments for, 405.
and its problems in Chosen, U.S.D.A. 120.
Department of, *see* United States Department of Agriculture.
electricity in, *see* Electricity.
Federal-State relations, 834.
history of, in Europe and America, 559.
how to be financed? 404.
in Denmark, as affected by war, U.S.D.A. 555.
in Finland, U.S.D.A. 263.
in Haiti, U.S.D.A. 120.
in Norway, U.S.D.A. 120.
in Turkey, changing agro-economic policy, U.S.D.A. 263.
in United States, 1839 and 1939, 404.
income parity for, U.S.D.A. 692.
permanent aspects of supply and price adjustment in, 115.
Philippine, a problem of adjustment, U.S.D.A. 836.
poverty in, problem, 404.
State legislation dealing with, Ohio 551.
use of normal value concept as stabilizing influence, 405.
*Agrilus communis rubicola*, control, 226.
*Agropyron*—
*inerme* for erosion control, Wash. 160.
*inerme*, notes, Wash. 229.
Iowa species, 745.
spp., transpiration ratio, 169.
Aircraft insect problem, 793.
*Alabama argillacea*, *see* Cotton leaf worm.
Albumin, egg—
crystalline, denaturation, effect on nitrogen content, 587.
injury, histological changes in tissues and nerve cells from, Wis. 126.
protein, efficiency in forming serum albumin, 128.
quality relation to pH and cloudiness, 534.
toxicity, relation to certain proteins, Wis. 126.
watery, Wash. 229.
*Alcaligenes* spp., taxonomic relations to soil saprophytes and plant parasites, 40.
Alcohol production and use by plant tissues, 37.
Alcohols, sugar, quantitative estimation, rapid micromethod for, 725.
Alder leaf disease, new species of *Taphrina* causing, 214.
*Aleyrodes azaleae*, notes, Ala. 519.
Alfalfa—
and grass mixtures in rotation for 2 years or longer, benefits, Ohio 480.
bacterial wilt in Virginia, U.S.D.A. 344.
breeding, N.J. 617, Nebr. 760.
bronze top, correction by boron, West. Wash. 202.
clover-timothy seedings, mixed, productiveness, Ohio 480.
conservation of nutrients as silage and as hay, Vt. 667.
culture experiments, Wyo. 481.
cuttings, development, effect of plant hormones, 172.
decomposition, transformation of phosphorus during, 313.
double fertilization in, significance, Wis. 333.
downy mildew in Illinois, U.S.D.A. 788.
downy mildew in Virginia, U.S.D.A. 344.
effect on aphid population in canning pea district, 87.
failures, etiology and prevention, Wash. 202.
feeding value for lambs, Wyo. 530.
fertilizer experiments, N.Mex. 48, P.R. Col. 617, Wash. 185, Wyo. 481.
for range ewes and lambs, barley as supplement to, Nev. 529.
growing in permanent bluegrass pastures, Ohio 480.
hay—
and cane fodder, relative net energy values, 382.
as sole ration for dairy cattle, and relation to sterility, Nev. 536.
barn air-cured, 675.
cut at 3 stages of maturity, value, 675.
dehydrated, and vitamin A, relative efficiency, 675.
of varying phosphorus content, availability of phosphorus in, Tenn. 530.

Alfalfa—Continued.
hay—continued.
production, Mich. 483.
v. lespedeza hay for bred ewes, Ky. 528.
v. *silage for fattening yearling* steers, Tenn. 529.
v. wheat bran v. cottonseed meal as protein supplements to silage in winter rations for calves, 384.
improvement, Colo. 754.
in mixtures with grasses, tests, Wyo. 481.
irrigation, duty of water in, N.Mex. 114.
molasses silage v. alfalfa hay as roughage for dry-lot fattening of steers, Ky. 528.
mosaic and potato calico viruses, relation, 347.
new *insect pest of*, U.S.D.A. 84.
pasture v. dry lot for fattening pigs on corn and tankage, Wyo. 530.
planting practices for good stands, Colo. 186.
resistant to stem nematode, 354.
response to cultivation and manure, Wyo. 481.
root rot, N.Mex. 69.
seed fields, lygus bugs in, control by cultural practices, Utah 523.
*seed formation in, factors affecting*, 619.
seed setting in, Nebr. 760.
silage, *see* Silage.
snout beetle, soil fumigation for control, 663.
soybeans, and sorgo, comparative forage yields, Nebr. 760.
sterility in due to starvation of endosperm, Wis. 333.
timothy seedings, improvement by use of cultipacker, Wis. 333.
variety tests, Ky. 479, Me. 333, N.J. 617, Nebr. 759, Tenn. 481, Wash. 185, West.Wash. 185, Wis. 333, Wyo. 481.
*vitamin K from*, 298.
vitamin K isolation from and history of its discovery, 733.
weevil, climatic limitations of, Calif. 663.
weevil population, effect of *Bathyplectes curculionis* on, Calif. 664.
yellows relation to boron in soil, 207.
yields of varietal leaders, N.Mex.760.
Alfileria, processing seed of, U.S.D.A. 618.
Algae—
*development, effect of environmental* factors, 26.
green, and reduction of carbon dioxide in dark, oxyhydrogen reaction, 752.
green, carbon dioxide reduction with molecular hydrogen in, 467, 602.
green, induction period of photosynthesis and light respiration, 602.
one-celled green, new growth factors, 468.
role in nitrogen cycle of soil, 312.
Algarroba beans for fattening swine, value, Hawaii 528.
Alkali—
salts, effect on plant growth, 37.
soils, character, fertilization, and management, *Iowa* 22.
Allergy in domestic animals, 686.
Alloxazine-adenine-dinucleotide as substitute for vitamin B complex factors, 711.
Almonds—
pollination, 194.
production abroad, 695.
vitamins A and $B_1$ in, 707.
*Alnus* through *Ampelopsis*, host-parasite check list revision, 636.
*Altamiranoa*, genus, history and status, 169.
*Alternaria*, pathogenicity and taxonomy, Fla. 634.
Aluminum in—
*nutrition, study by spectrographic analysis*, 413.
plants, 599.
*Amara fallax*, intermediate host of chicken cestode, 255.
*Amblyomma maculatum*, *see* Tick, Gulf coast.
Ambrosia beetles and associated fungi, 81, 378.
American—
Chemical Society, papers, 667.
Dairy Science Association, papers, 672.
*Farm Economic Association, proceedings*, 404.
Phytopathological Society, southern division, meeting, report, 779.
Society of Biological Chemists, papers on animal nutrition, 667.
*d*-Amino acid oxidase, reduction in rat tissues in riboflavin deficiency, 712.
Amino acids—
in corn kernel, 9.
infrared absorption spectra of, 725.
interdependence in their utilization in endogenous metabolism, 230.
required to replace endogenous losses of nitrogen in rats, 230.
Amitosis, critical review, 315.
*Amoebotaenia sphenoides* of poultry, intermediate hosts, 255.
*Ampeloglypter ater*, notes, Mass. 796.
*Amphicoma vulpina*, studies, Mass. 796.
*Amphorophora rubi*, biology, 798.
*Amygdalus* spp., plant disease check list revision, U.S.D.A. 782.
Amylase—
$\alpha$ and $\beta$, effect of adding to dough, 294.
$\alpha$, *activity, standard Wohlgemuth procedure for*, 440.
$\beta$, from soybeans, action on starches, 296.
salivary, effect of fluorides on activity, 427.
Amylases, action on raw wheat starches, 9.
*Anabrus simplex*, *see* Cricket, Mormon.
*Anacampsis fragariella*, life history and control, 90.
*Anacardium* through *Bertholletia*, host-parasite check list revision, 783.

Anaerobes—
associated with foot rot in sheep, 822.
metabolism and proteolytic enzymes, 467.
spore-forming, causing spoilage in acid canned foods, 155.
*Anaferonia constricta*, intermediate host of chicken cestode, 255.
Analysis, committee on methods, report, 436.
*Anaplasma centrale*, intra-uterine transmission, 543.
Anaplasmosis—
hereditary transmission by ticks, 106.
transmission by *Dermacentor andersoni*, 395.
Anaplasmosis-like disease of swine, 545.
*Anasa tristis*, *see* Squash bug.
*Anastrepha ludens*, *see* Fruitfly, Mexican.
*Ancylis comptana*, *see* Strawberry leaf roller.
Androgenic activity, biological indicators, 614.
Androgens—
percutaneously applied, variations in effectiveness in rats, 331.
response of pullets to, 46.
*Andropogon*, cytotaxonomic studies, 472.
Anemia—
and blood studies, Hawaii 562.
aplastic, notes, 242.
due to iron deficiency, in children, 274.
equine infectious, changes of central nervous system in, compared with other virus diseases, 819.
extent among children and adults, Fla. 699.
from lysine deficiency in deaminized casein, 667.
hemorrhagic, blood picture in, Minn. 140.
hypochromic, in dogs, relief with synthetic vitamin $B_6$, 810.
iron-resistant, and latent rickets in school children, 274.
nutritional, relation to vitamin C deficiency, 138.
pernicious, etiological factors in, 243.
types, papers on, 243.
Anemometers, experimental studies, 738.
Aneurin, *see* Vitamin $B_1$.
Angiosperms—
sex-expression in, genotypic basis, 470.
taxonomy, 596.
woody catkin-bearing, floral structure, ontogenetic and anatomical studies, 466.
*Angitia platyptiliae* n.sp., description, 91.
*Anguillulina*—
*dipsaci*, structure of leaf galls induced by, 69.
*tritici* in the Crimea, 362.
Animal—
breeding—*see also* Breeding *and specific animals*.
possibilities of genetics for, 474.
research, suggestions, 178.
chromosomes, *see* Chromosomes.
diseases—*see also specific diseases*.
control, fundamentals of, 677.
diagnosis, Mass. 823.
etiology and pathogenesis, 821.
Animal—Continued.
diseases—continued.
of genital organs, 243.
transmissible, report of committee on, 678.
fats, *see* Fats.
nutrition—
effect of mineral oil ingestion, Ariz. 561.
iodine in, 669.
relation to minerals of wheat, Utah 273.
relation to vitamin B complex, 383.
role of boron and zinc in, Wis. 95.
organs, vitamins in, Wis. 126.
parasites, *see* Parasites.
tissues—
coenzyme I in, effect of nicotinic acid deficiency, 133.
creatine in, glycocyamine and methionine as precursors, 667.
sensitive to oestrogens, histogenesis of, 615.
Animals—*see also* Cattle, Livestock, Mammals, Sheep, *etc.*
adaptive coloration in, treatise, 514.
and man, relation to environment, Me. 410.
and plants, defense mechanisms in, symposium, 346.
domestic—
corynebacteria in, Ky. 540.
growth and development, Mo. 672.
in Burma, ectoparasites of, check list, 218.
nicotinic acid and grass juice factor requirements, 382.
parasites, 364.
parasites of, in Sweden, 686.
fluorine tolerance of species, Wis. 95.
fur-bearing—
of Iowa, Iowa 215.
ranches, changes in virulence of distemper virus on, 252.
illness or death, due to nutritional deficiency, Ky. 540.
sex control in, 615.
tissue reactions and natural resistance, including immunity, 821.
treated with hypophyseal extracts, progonadotropic sera of, 45.
Annatto detection in cream, 538.
*Anomala*—
*orientalis*, *see* Oriental beetle.
spp., life histories, Ky. 800.
*Anopheles*, *see* Malaria *and* Mosquitoes.
*Anoplocephala perfoliata* infestation in Philippine horses, 251.
Anoxemia effect on dark adaptation of normal and vitamin A-deficient subject, 850.
*Anthomyza angelicae*, new pest of hollyhock, 83.
*Anthonomus*—
*eugenii*, *see* Pepper weevil.
*grandis*, *see* Bollweevil.
*grandis thurberiae*, *see* Thurberia weevil.

*Authonomus*—Continued.
*musculus*, *see* Cranberry weevil.
*signatus*, *see* Strawberry weevil.
Anthracnose—*see also specific host plants*.
fungus on cotton plant, distribution S.C. 501.
Anthrax—
outbreak in minks, 252.
symptomatic, *see* Blackleg.
*Anthrenus scrophulariae*, *see* Carpet beetle.
Antihemorrhagic—*see also* Vitamin K.
compounds, synthesis of, 15, 585, 586.
compounds, synthetic and natural, 585.
Antihormones, history and action, 184.
Antineuritic vitamin, *see* Vitamin $B_1$.
Antirachitic, *see* Rickets *and* Vitamin D.
Antiscorbutic, *see* Vitamin C.
Ants—
control in lawns and putting greens, R.I. 334.
control, varied attacks successfully used, 718.
relation to Japanese beetle and parasites, 226.
white, *see* termites.
Antuitrin-S, effect on late pregnancy in rats. 758.
*Anuraphis*—
*persicae-niger*, *see* Peach aphid, black.
*roseus*, *see* Apple aphid, rosy.
Apanteles, undescribed species, notes, 222.
*Apateticus cynicus*, notes, 517.
*Aphelenchoides ritzemabosi*, inefficacy of methyl bromide fumigation against, 649.
Aphididae of Nevada, 88.
Aphids—
control on sorghum in greenhouse, selenized soil for, 78, 365.
of Florida, biology and control, Fla. 650.
of Ohio, 798.
of South Sea Islands, 83.
on apple trees, tests with insecticides for, Wis. 364.
parthenogenetic female, developmental history of germaria in, 221.
significance as virus vectors on beets and potatoes, 507.
woolly, see Apple aphid, woolly.
*Aphis*—
*acritus* n.sp., description, 798.
*gossypii*, *see* Cotton aphid.
*idaei*, biology, 798.
*maidis*, *see* Corn leaf aphid.
*nociadae*, biology and control, Fla. 650.
*pomi*, *see* Apple aphid.
*tulipae*, biology and control, Fla. 650.
*Aphodius lividus*, life history, 527.
Aphosphorosis, relation to parturient hemoglobinemia in cows, 110.
Aphylloides subgenus, redefined, 169.
Apiary inspection, Conn.[New Haven] 651.
Apiculture, *see* Beekeeping.
*Apioporthe* and related conidial forms, fungi associated with, 348.
*Aplanobacter stewarti*, sectoring in colonies, 69.
*Aplopappus tenuisectus* n.comb., notes, 324.
*Apotemnus* n.g. and n.spp., description, 804.
Apparatus—
continuous liquid-extraction, mechanically operated, 438.
for determining riboflavin in foods, 152.
for fixing and dehydration, 464.
for holding a vial or test tube, 588.
for measurement of rigidity of starch paste, 150.
for measuring turgor pressure of large cells, 35.
for seed treatment against grain loose smut, Okla. 74.
glass needle used for isolating single spores, 785.
melting point, electric, 588.
precipitate dryer, description, 8.
psychrometer, motor-ventilated, description, 738.
to prevent bumping and promote boiling, 588.
Apple—
anthracnose, control, Me. 344.
aphid—
green, tests with insecticides for, Wis. 364.
rosy, control, 218, Ky. 518.
rosy, control, experimental spraying for, Pa. 367.
rosy, newer dormant sprays for, 367.
rosy, studies, Me. 363.
studies, Me. 363.
woolly, soil fumigants for, 221.
woolly, studies, Me. 363.
aphids, control experiments, technic in, 656.
bitter pit development, effect of mulching, N.H. 783.
bitter rot, copper sprays for control, Del. 68.
boron-deficiency disease, 355.
dieback in California, 79.
diseases in Massachusetts, U.S.D.A. 500.
drop and apple cork spot, effect of boron, N.H. 772.
fire blight, report of conference on, U.S.D.A. 356.
flowers, pollen germination on stigmas treated with fungicides, 492.
fruit set, effect of tar oil spray for prevention, 629.
fruitfly, studies, Me. 363.
grain aphid, studies, Ky. 518, Me. 363.
insect outlook for 1940, in Illinois, 523.
insects, control, 522.
insects, test of insecticides against, N.Y.State 217.
internal cork, control by boron, 355.
juice, galacturonic acid from, Wash. 150.
juice, making table sirup from, Wash. 150.
juice, studies, Wash. 150.
layers, root forming ability, 491.

Apple—Continued.
leaf curling midge, biology and control, Mass. 796.
leaves and fruit, effect of thiocyanate sprays, 339.
maggot, control, Conn.[New Haven] 652, Mass. 796.
maggot control board of Nova Scotia, report, 523.
maggot, studies, U.S.D.A. 83.
measles, studies, Mo. 202.
orchards—
boron problems of, 508.
optimum life of, 628.
soil management, Del. 57.
vetch as cover crop for, Ark. 56.
perennial canker, control, Me. 344.
products, feeding value, 233.
rootstocks, studies, 60.
rots, etiology and control, Wash. 202.
rusts in Shenandoah Valley, U.S.D.A. 783.
scab—
control, Mass. 783, Me. 344.
control, eradicant fungicides as aid, Wis. 345.
control, spray materials for, Nebr. 771.
control with eradicant sprays, history and status, 509.
control with mild sulfur sprays, 356.
development, U.S.D.A. 344.
development in storage, 80.
effectiveness of eradicant sprays, 356.
effectiveness of sulfur sprays for, 355.
in storage, 201.
life history of causal fungus and copper and sulfur sprays for, N.J. 635.
notes, U.S.D.A. 344.
spray schedule, ascospore discharge relation to, N.H. 783.
spraying for, N.H. 783.
season of 1939, climatic conditions, relation to production, 338.
slices, canned in sirup, Mass. 843.
soft rot caused by *Trichoseptoria fructigena*, 213.
sprays, tests, Conn.[New Haven] 651.
stocks, hardy, methods of propagating, Wash. 190.
styles, pollen tube growth after intervarietal cross-pollination, 492.
thinnings, availability as source of pectin, Wash. 150.
tree borer, roundheaded—
biology and control, N.Y.State 802.
control, Ohio 518.
trees—
Blaxtayman and Gallia Beauty, Malling understocks for, Del. 57.
calcium cyanamide as source of nitrogen for, Mo. 189.
complete fertilization, Mo. 189.

Apple—Continued.
trees—continued.
delayed dormant spray for, replacing cresylic acid with tar oil, 653.
fertilization, N.H. 771.
in sand culture and in commercial orchards, magnesium deficiency of, 508.
pruned and unpruned, effect of seedling- and own-rooted understocks on growth, Del. 57.
pruning, Ark. 56.
pruning experiments on young stock, Mo. 194.
receiving nitrogen treatments, carbohydrate-nitrogen relations, Del. 57.
summer spraying, semirefined oils for, 366.
3-year-old, root development on Coastal Plain soil, N.J. 628.
water requirements and irrigation, Nebr. 771.
young, growth and assimilation, effects of nitrogen, potassium, and phosphorus, 492.
young, importance of soil pore space to, N.Y.State 194.
white root rot, due to *Corticium galactinum*, 80.
Apples—
affected with internal cork, behavior in storage, Mass. 771.
breeding, 59, N.J. 628.
clonal rootstock for, Mass. 771.
Comstock's mealybug as orchard pest, 221.
consumers and restaurants buying, and quantities and price paid, Del. 116.
crab, *see* Crab apples.
cultivation v. mulching for, Mass. 771.
effect on calcium retention, 847.
embryo growth and development, Mo. 189.
fertilizer requirements, Mass. 771.
foliage and fruit injury from spray materials, 509.
fruit bud mutation in, Mass. 771.
fruit set following daily exposure of flowers to insects, Ohio 195.
Granny Smith, superficial scald in, 61.
Gravenstein, calyx end structure in, 195.
harvested, methods of sun-coloring, Mass. 771.
Hibernal and Northwestern Greening, chromosome numbers, 491.
injury from use of standard spray schedules, Del. 85.
Jonathan and Grimes Golden, maturity studies, 60.
Jonathan, soft scald in, physiological study, 509.
lead-arsenate-sprayed, noninjurious to swine in moderate amounts, 684.
losses from plant diseases, U.S.D.A. 201.

Apples—Continued.
McIntosh—
comparison of solid blush and striped strains, Me. 335.
preharvest drop, affected by nitrogen-carrying fertilizers, 629.
premature dropping, Mass. 771.
spur nitrogen and preharvest drop. 629.
morphology of flower, [N.Y.]Cornell 774.
new hardy for Northwest, S.Dak. 774.
new rootstocks for, tests, N.Y.State 775.
pollination, 194.
potential production, relation to growth status, N.J. 628.
premature dropping, relation to curculio injury, Del. 57.
preventing excessive abscission by spraying with growth substances, 629.
price differences received by Ulster County, New York, growers, reasons for, 840.
production of ethylene in ripening process, Minn. 339.
pruning, Iowa 491, N.J. 628.
quality, spray schedules for, Miss. 193.
rate of ripening, effect of type of storage, Ohio 488.
red strains, effective date for picking, Ohio 488.
rootstocks for, N.H. 772, Nebr. 771.
size, effect of artificial drought on, Ohio 488.
spray residue studies, N.J. 625.
spray schedule for 1940, 509.
spraying, N.H. 771.
storage troubles, 500.
sun coloring, in Delaware. 195.
thin wood pruning, Mich. 60.
thinning, 339.
thinning an essential to quality and yield, Miss. 491.
time of winter injury, relation to time of applying nitrogen, N.H. 772.
total yields, on young trees, 628.
varietal susceptibility to rust organisms, 646.
varieties, effect of Malling II and IX rootstocks on, 491.
varieties, new, survey of growers on performance, N.Y.State 775.
vitamin C in, 715.
yields, costs, prices, markets, etc., N.J. 688.
Apricot—
brown-spotting, a boron-deficiency disease, 356.
gum-spot disease in South Africa, 356.
trees, unthinned, fruit size, relation to crop and season, 492.
Apricots—
canned, annual average f. o. b. prices, statistical analysis, Calif. 840.
dried, color and $SO_2$ retention, effect of drying and storage conditions, 156.
*Aptilopsylla carlsbadensis*, n.g. and n.sp. from an unkown host, 525.
*Arabis* genus in Iowa, 745.
Arborvitae, oriental, blight caused by *Coryneum berckmanii*, 647.
*Arctostaphylos elegans*, status, 324.
*Argyrotaenia velutinana*, see Leaf roller, red-banded.
Arkansas Station, notes, 288, 864.
Arkansas Station, report, 143.
Arkansas University, notes, 288, 864.
*Armillaria root rot in citrus groves*, 790.
Armyworm—
beet, studies, U.S.D.A. 84.
control, Mo. 217.
fall, Fla., 651.
fall, relation to European corn borer situation, Me. 363.
notes, Tenn. 519.
response to lights, Ohio 518.
southern, studies, U.S.D.A. 84.
Arrowgrass, dangerous because of hydrocyanic acid, Wyo. 541.
Arsenic, effectivness in preventing selenium poisoning, 531.
Arsenical—
spray residues—*see also* Spray residue *and specific fruits and vegetables.*
elimination from soils, N.J. 592.
sprays, accumulations in orchard soils, Wash. 160.
sprays, substitutes for, Mo. 217, Wis. 364.
Arsphenamines, antispirochetal action in vitro, 822.
Arteriosclerosis, experimental, relations to aging, Ark. 127.
Arthritis in swine, Wash. 242.
Artichoke plume moth—
larvae, methyl bromide as fumigant for, 90.
new *Angitia* parasitic on, 91.
*Ascaridia lineata*, food of, 254.
*Ascaris*—
*equorum* infestation in Philippine horses, 251.
*lumbricoides*, hematin in intestines of, 686.
*suum*, saline requirements of larvae, 395.
*Ascia rapae*, *see* Cabbageworm, imported.
*Ascochyta* blight of cotton, outbreak, U.S.D.A. 783.
*Ascogaster carpocapsae*, notes, 658.
Ascomycetes—
from Minas Geraes, Brazil, 596.
new taxonomic data, 456.
Ascorbic acid—*see also* Vitamin C.
as substrate in oxidase measurements, 445.
biological synthesis, role of manganese in, 422.
concentration in endocrines and organs, effect of Walker carcinosarcoma, Ark. 127.
destruction in rumen of dairy cow, 670.
effect on calcium retention, 570.
effect on poliomyelitis virus, 189.
excretion, relation to saturation and utilization, 187.

Ascorbic acid—Continued.
in animal tissues, possible carrier role of, 855.
in bananas, variations in, 136.
in blood and urine after oral administration of vitamin C, 422.
in blood serum, factors preventing oxidation, 855.
in certified milk, effect of pasteurization, 282.
in feces, determination, 569.
in milk, effect of heat treatments, 816.
in orange juice, fresh, effect of refrigeration, 136.
in tomato juice, effect of refrigeration, 136.
in tomatoes, effect of home canning and subsequent storage, 136.
oxidation, effect of bacteria, 137.
plasma, of infants and children, 855.
Ash analysis and microincineration, 726.
Ash, green, growth of seedlings, relation to subsoil acidity and fertility, 342.
Asparagine metabolism, 230.
Asparagus—
beetle control, S.C. 519.
breeding, N.J. 625.
butts, digestibility, Calif. 532.
cooked in fat, calcium and phosphorus in, 273.
crown-grading experiments, Calif. 191.
deep soil treatment essential for, 336.
depth of planting, Tenn. 489.
fern caterpillar, life history and control, 798.
fertilizer requirements, Ga.Coastal Plain 625, Wash. 190.
home-canned green, nature of yellow deposit in jars, 134.
manure experiments with, Ark. 626.
nutrient deficiencies, effect of root temperatures on development, N.J. 625.
planting, care, and management, Ill. 772.
production in California, effect of spacing, 626.
quality, tenderometer readings as an index, 626.
studies, P.R.Col. 625.
varieties and culture, Mass. 771.
waste as source of asparagin, Wash. 150.
yield and size of spears, S.C. 488.
yields, effect of spacing and length of harvesting period, Iowa 191.
Aspartic acid metabolism, 230.
*Aspergillus*—
and *Penicillium* and their nitrate metabolism, classification, 467.
and *Penicillium* relations, 467.
*niger*, carbon nutrition relation to trace-element and accessory requirements, 38, 468.
*niger*, growth, effect of nitrogen compounds and trace elements, 38.
spp. extracts, vitamin C in, 598.
spp., genetic changes in, chemical induction, 177.
*Aspergillus*—Continued.
spp., mutations and reversions in, 456.
*sydowi*, enzyme-resistant protein of, 467.
*sydowi*, isolation of nitrogenous compounds from, 487.
variations in, 467.
*Aspidiotus ancylus*, *see* Putnam's scale.
Assassin bugs, three species in Tucson area of Arizona, 220.
Association of Land-Grant Colleges and Universities—
convention, 144.
proceedings, 268.
*Asteia multipunctata* n.sp., description, 92.
*Astragalus*—
*artemisiarum* as selenium absorber, 599.
*bisulcatus*, distribution of selenium in, and seleniferous soils, 748.
n.spp., notes, 596.
*speirocarpus*, studies, Nev. 540.
Atherosclerosis, cholesterol-induced, in rabbits, effect of iodine and minerals, 668.
Atmometer, Livingston, response to single meteorological factors, 446.
Atmosphere—
lower layers, constancy of horizontal turbulent shearing stress in, 158.
warm sectors, development and occlusion, 158.
Atmospheric—
condensation nuclei, physical, meteorological, and bioclimatic significance, 19.
moisture, relation to ecological problems, 19.
pressure systems, cyclonic and anticyclonic development, 158.
Atmospherics in South Africa, location of sources of, 305.
*Atropellis* genus, revision, 647.
Aujeszky's disease, *see* Paralysis, infectious bulbar.
Aurantioideae, new varieties and new combinations in, 40.
*Autographa brassicae*, *see* Cabbage looper.
*Autoserica castanea*, *see* Garden beetle, Asiatic.
Auxin—
formation in plants, relation to boron, 172.
in *Avena* coleoptiles, light stability of, 172.
production, in isolated roots growing in vitro, 461.
Auxins, chemical structure and biological activity, relation, 455.
Avitaminosis in diabetic patients under insulin therapy, 714.
Avocado—
diseases, control, Fla. 635.
fruit spots, control, 357.
leaf symptoms for deficiencies in solution cultures, 62.
meal, digestibility, Calif. 532.

Avocado—Continued.
seedlings, growth and transportation, effect of artificial winds of low intensity, 62.
seedlings, growth, effect of pH, 62.
seedlings, growth, effect of root temperature, 62.
Avocados—
anatomy, 35.
culture, Fla. 625.
studies, P.R.Col. 625.
use in swine rations, Hawaii 528.
Azalea—
disease affecting flowers, 80.
flower spot in Texas, U.S.D.A. 635.
insect pests, control, Ala. 519.
lacebug, notes, Ala. 519.
leaf miner, notes, Ala. 519.
*Monilinia* causing brown rot and blight, 514.
twig and bud blight, due to *Sporocybe azaleae*, new stages of, 513.
Azaleas, resistance to fumigation with methyl bromide, 214.
*Azolla filiculoides*, sporangium development in, cytology, 606.
*Azotobacter*—
activity, relation to surface soil acidity, N.Dak. 742.
*chroococcum* inoculated into sterilized soil, survival, 27.
*chroococcum*, synthesis of coenzyme R by, 468.
distribution and activity in range and cultivated soils, Ariz. 164.
fixation of atmospheric nitrogen by, colloidal clay as basic medium, 29.
nutrition, molybdenum and calcium in, 468.
Baby beef, *see* Cattle, baby beef.
Bacilli, mesophilic, taxonomy, 467.
*Bacillus*—
*abortus*, *see* Abortion *and* *Brucella abortus*.
*coli*, variations, relation to bacterial inhibitory agents, 822.
*enteritidis*, *see* *Salmonella enteritidis*.
genus, description of dextro-lactic acid forming organism of, 607.
genus, relation between temperature growth range and size in, 607.
*krzemieniewski*, bacteriological studies, 28.
*krzemieniewski* n.sp., nature and properties of polysaccharide produced by, 28.
*larvae*, nitrite nitrogen test for, 378.
*larvae*, thermal resistance, 378.
*mallei*, artificial infections of goat, sheep, and dogs with, 678.
*megatherium* inoculated into sterilized soil, survival, 27.
*radicicola*—*see also* Legumes, inoculation, *and* Nodule bacteria.
spp., aerobic sporeformers, production of acetylmethylcarbinol by, 752.
Bacon, Wiltshire, bacteriology, quantitative analysis of curing pickle, 583.
Bacteria—
acidfast, staining method, 165.
action of radioactive radiations on, 467.
adsorption by, 454.
aerobic and anaerobic, proteases of, 467.
aerobic, nonspecific growth factors of, 468.
air-borne device for sampling, 240.
anaerobic, *see* Anaerobes.
classification, effect of variation on, 466.
counting by microscopic method, 468.
development from single cell, motion pictures of, 466.
enzymatic cellular divergencies, 467.
estimating numbers, evaluation of errors by plating method, 469.
fermentation of sugar acids by, 469.
growth, and glutamine, 468.
growth factors for, 460.
in Hawaii, and hosts, check list, U.S.D.A. 345.
in lactic and butyric groups, growth factor requirements, 468.
in milk and soil, *see* Milk *and* Soil.
morphogenesis and formation of colonies, 466.
non-spore-forming, heat resistance of, determination, 155.
nutritive conditions, dependence on oxygen optimum, 467.
oxidase, and other reactions, relation to dairy products, 587.
phytopathogenic, relations, 345.
preparation of an active juice from, 607.
primitive forms, in milk and milk products, 190.
production of tryptophanase by, 467.
purple, carbon dioxide reduction with molecular hydrogen in, 467.
respiratory systems in, 467.
thermoduric, resistance to chlorine disinfection, 673.
toxicity of basic fuchsin for, 456.
toxicity of cerium compounds for, 745.
utilization of $CO_2$ by, 467.
Bacterial—
antagonism, 745.
cell nucleus, problem of, 467.
cells, living, effect of ultrashort electric waves on, 467.
cells, radiant energy from, new factor in symbiotic phenomena, P.R.Col. 581.
chemotherapy, nonsulfur compounds of interest in, 822.
characters, independent variation in, 467.
condition of foods, resazurin reduction rates and bacterial plate counts as indices, 581.
counts, making by rolltube method, suitability, 581.
cultures, detection of hydrogen sulfide in, by salts of cobalt and nickel, 456.
cultures, oxygen demand and oxygen supply, 467.

Bacterial—Continued.
development, effect of electric field of atmosphere, 467.
infections, chemotherapy of, status, 821.
metabolism, luminescence and respiration in, 467.
photosynthesis and oxygen, 467.
pigment, new type, 467.
population, serological analysis of, 466.
studies, errors of plate method, 468.
toxins, effect of sulfanilamide and related compounds, 822.
type transformation, 467.
Bacteriological—
nomenclature, code, 466.
studies, sterile transfer chamber for, 595.
Bacteriology—
dairy, classification in, 817.
determinative, Bergey manual, changes in outline of classification, 466.
mathematics in, 323.
pathogenic, and immunity for domestic animals, 394.
significance of conceptions genotypus and phaenotypus to, 466.
textbook, 677.
Bacteriophage—
effects of ultraviolet radiation and X-rays, 467.
factor in disease resistance, Ohio 501.
in classification of aerobic spore-formers, *Bacillus* spp., possible utilization, 752.
method for concentration and purification, 467.
precursor of, 467.
purified, 467.
Bacteriophages—
and viruses, ultracentrifugation and serological reactions, comparison, 345.
plant and insect viruses, comparative studies on ultracentrifugation and serological reactions, 819.
Bacteriophagy, research on and problem of virus, 345.
*Bacterium*—
*coli*, *see Escherichia coli.*
*necrophorum* in chronic ulcerative colitis, 823.
*phytophthorum*, cause of potato blackleg, 353.
*pruni* canker of cherries, Mo. 201.
*pruni* on peach, relation of nitrogen fertilization to control, 781.
*pruni* on peach, relation to nitrogen fertilization, 780.
*pseudotsugae*, galls on *Pseudotsuga macrocarpa* induced by, 647.
*pullorum*, *see Salmonella pullorum and* Pullorum disease.
*radicicola*, *see* Legumes, inoculation, *and* Nodule bacteria.
*stewartii*, mutation in, Iowa 68.
*translucens* v. *undulosum*, studies, 41.
*tularense*, persistence in tissues of argasid ticks, 804.
*tularense*, studies, 823.
*Baeus californicus* life history, notes, 665.
Baking—
maltose fermentation activators affecting, 441.
oven, experimental, uniform temperature maintenance, 296.
Balloons, radio-sounding, improvement in, 18.
Balsam fir needle blight due to *Rehmiellopsis bohemica*, U.S.D.A. 500.
Banana—
black end and anthracnose, cause, 510.
diseases, P.R.Col. 635.
leaf spot, P.R.Col. 635.
phloem and neighboring tissues, pathological changes in, 789.
products of variety Giuba, chemical composition, 700.
variety, Giuba, chemical composition, 700.
Bananas—
ascorbic acid in, variations in, 136.
Gros Michel, refrigerated gas storage of, 777.
production of ethylene in ripening process, Minn. 339.
Barberry eradication, 207, N.Dak. 503, U.S.D.A. 68.
Barium—
determination, colorimetric method for, 581.
soils high in, fertility, 166.
Bark beetles—
and borers, control with chemicals, 516.
damage to plantation pine, Conn.[New Haven] 652.
isolation of *Ceratostomella ulmi* from, 648.
Barley—
as supplement to alfalfa for range ewes and lambs, Nev. 529.
brachytic mutation in, genetic and cytologic studies, 754.
breeding, Mo. 185, N.J. 617, N.Mex. 48, Nebr. 759, Tenn. 481, Wash. 185.
breeding, methods in, U.S.D.A. 470.
bulbous, processing seed of, U.S.D.A. 618.
covered smut, seed disinfection tests, irregular results in, 350.
culture experiments, Wyo. 481.
disease-resistant breeding stocks, location and testing, Wis. 345.
diseases, control, Mo. 201.
fertilizer experiments, Ark. 48, Wyo. 481.
improvement, Colo. 754.
loose smut, control by vacuum treatment, 346.
loose smut, machine for control, Okla. 74.
losses from plant diseases, U.S.D.A. 201.
male sterile character in, new tool for plant breeder, 754.
outstanding varieties, N.Dak. 49.
phosphorylation and respiration in, 34.
planting tests, Nebr. 760.

Barley—Continued.
respiration, effect of cyanide on, 319.
roots, accumulation of salt by and pH effects, relation to metabolism, 319.
seed treatments, Ark. 637.
surface v. furrow drilling, Nebr. 760.
tests for yield, cultural requirements, and malting quality, Wis. 333.
v. corn for fattening pigs on pasture, Tenn. 529.
varieties recommended, Nebr. 618.
varieties registered, 49.
variety tests, Ark. 48, Del. 48, Me. 333, Mo. 185, N.J. 617, N.Mex. 48, Nebr. 618, 759, Tenn. 481, Wash. 185, Wyo. 481.
western Canadian, feeding value for bacon hogs, 384, 385.
winter, for swine, adaptability and value, Mo. 229.
yields and other data, Nebr. 618.
yields, effect of time of seeding, Wis. 49.

Base exchange capacity, electrometric determination, Hawaii 448.

Basidiomycetes—
new taxonomic data, 456.
sexuality in, 468.

*Basisporium gallarum*, pathogenicity to corn, Iowa 68.

Bat, female, longevity of sperm in, 615.

*Bathyplectes curculionis*, larval parasite of alfalfa weevil, Calif. 664.

Bats—
New England, migrations, 215.
parasite of, 364.

Bean—
*bacterial blight, control*, 780.
bacterial blights, breeding for resistance, Nebr. 783.
beetle, Mexican—
notes, Tenn. 519.
paris green toxicity and repellency to, relation to particle size, 661.
studies, U.S.D.A. 84.
tachinid parasite of, U.S.D.A. 373.
*black root, new virus disease of snap* beans, 511, 781.
blight, common and halo, varietal reactions and control tests, Wyo. 502.
blights, relation to temperature, 75.
disease, hitherto unreported due to aerial species of *Rhizoctonia*, Fla. 634.
flour, principle with progesterone-like activity obtained from, 613.
*halo blight in Florida*, Fla. 634, U.S.D.A. 500.
jassid, control, Fla. 650.
leaf area, determination, and relation to yield, U.S.D.A. 764.
mosaic resistant and nonresistant Green Refugee variety, disease in, 211.
nodules, ether extracts of, coleoptile assay, 172.
pod borer, larvae destruction, methyl bromide fumigation for, 89.
pod borer, studies, Hawaii 517.

Bean—Continued.
root knot resistance, 75.
rust, control, N.J. 635.
rust, etiology and control, Wash. 202.
rust, notes, Fla. 634, Hawaii 501.
seedlings, radiophosphorus in, absorption and movement, 174.
weevil, experimental population, destruction by *Pediculoides ventricosus*, 652.

Beans—*see also* Soybeans *and* Velvetbeans.
breeding, Me. 335, P.R.Col. 617, Tenn. 489.
breeding for quality and resistance to rust and powdery mildew, Fla. 634.
bush, arsenic toxicity to, Hawaii 501.
carbohydrate and nitrogenous compounds in, effect of $\alpha$-naphthaleneacetamide and $\alpha$-naphthaleneacetic acid, 319.
disease-free canning, excel in quality, Wis. 345.
dried, iron availability in, 274.
*Duluth snap, origin and distinguishing* characters, 336.
fertilizer experiments, P.R.Col. 617.
Green Refugee, mosaic resistant and nonresistant types, disease in, 211.
green snap, fresh and frozen, carotene in, 456.
home canning, Wyo. 562.
improvement, Mass. 771.
*inheritance of resistance to alfalfa* mosaic virus 1 and stringiness in, 178.
lima—
bud drop in the fall, Fla. 634.
bush, yields, S.C. 488.
culture experiments, Ga.Coastal Plain 625.
culture on special soils, West.Wash. 190.
*fertilizer experiments, Ga.Coastal* Plain 625.
natural crossing in, 489.
production of seed on nutrient-deficient plants, N.J. 625.
production, relation to fertilizer placement and seed spacing, 58.
spacing, West.Wash. 190.
variety tests, Ga.Coastal Plain 625.
*losses from plant diseases, U.S.D.A. 201.*
pinto—
breeding, N. Mex. 48.
flavin and vitamin $B_6$ in, effect of cooking, N.Mex. 126.
improvement, N.Mex. 619.
riboflavin and vitamin $B_6$ in, effect of cooking, 422, N.Mex. 421.
yields of varietal leaders, N.Mex. 760.
planting rates, Me. 335.
pole, preparation for hot weather yields, Miss. 287.
response to calcium deficiency, 173.
rust-resistant snap, development and selection, Hawaii 488.

Beans—Continued.
snap—
irrigation, Ark. 56.
N and P needs of, Ky. 488.
new virus disease of, 511, 781.
nutritive value, factors affecting, Mass. 843.
quality, reliability of retail prices as guides to, Ohio 116.
resistant to root and leaf diseases and nematodes, breeding, Ga. Coastal Plain 625.
vitamin C in, 135.
string, frozen, enzyme activity in, 154.
studies, P.R.Col. 625.
varieties for commercial canning, N.Y. State 191.
variety tests, 337, N.Mex. 48, P.R.Col. 617, West.Wash. 190.
Bedbug—
evaluating liquid insecticides against, 520.
toxicity of sulfur dioxide to, 797.
Bedding materials for livestock, absorptive capacity, 535.
Bedroom space inadequate in most Utah homes, Utah 559.
Bee—
bread and soybean flour as pollen substitutes for bees, 378.
foods, vitamins in, 378.
stings, serious reactions to, 363.
Beech—
bleeding canker, U.S.D.A. 201.
root system and mycorhizal relations in woodland soils, 604.
Beef—*see also* Cattle, beef.
amount of drip, relation to time of freezing after slaughter, 381.
amount of fat consumers want, 380.
flavor and juiciness, factors affecting, 381.
Government grade-stamped and packer-branded, consumer attitudes, 381.
production—
and quality, relation to method of feeding supplements, U.S.D.A. 233.
in California, 532.
on bluegrass, alfalfa, and clover pastures, economy of, Tenn. 529.
per acre of variously fertilized pastures, Ky. 528.
quality, effect of sorghum grains, Nebr. 805.
roasts and steaks, storing in freezer lockers, 381.
steaks, broiling methods, standardization, Mo. 269.
steers on pasture, effect of winter weight changes on gains, 381.
weight produced per animal unit and per section on ranches, N.Mex. 116.
Beekeeping—
as means of diversifying farming, Wis. 364.
laying workers in, 804.
Bees—
as pollinators, value, 516.
breeding, nutrition, and pollination, U.S.D.A. 84.
foulbrood, *see* Foulbrood.
lethal effects of insecticides, U.S.D.A. 84.
losses in Utah, 363.
mind of, 227.
outside wintering, Wyo. 519.
package, factors affecting, 94.
Package, management problems, Ohio, 803.
queen and worker, respiratory metabolism during larval and pupal development, 803.
studies, N.J. 651.
trees and shrubs of Michigan furnishing nectar and pollen to, Mich. 93.
two-queen colonies, Wyo. 519, 803.
wintering in Wyoming, Wyo. 803.
wintering v. destroying and restocking hives with package bees in spring, N.Dak. 803.
Beeswax—
characteristics, contaminants, processing, and uses, U.S.D.A. 217.
physical and chemical properties, U.S.D.A. 303.
Beet—
internal black spot, borax for control, 352.
leafhopper—
control in Idaho, 354.
on tomatoes, repellency of pyrethrin dusts to, 368.
partly desiccated, hydroxyl-ion concentration of saliva, 351, 797.
resistance of Chilean tomatoes to, 78.
studies, 354.
pulp v. sunflower silage, as supplement to native hay for dairy heifers, Wyo. 535.
soil, borax treatment for, Wis. 345.
sugar, stored, survival of thermophilic food-spoilage organisms in, 155.
Beetles—
bark and timber, of North America, north of Mexico, 226.
brood provision and rearing instincts, 522.
Beets—
canning, boron requirement, Mich. 489.
improvement, Mass. 771.
premature seeding studies, 489.
red garden, principal American varieties, types, U.S.D.A. 772.
reproduction in, physiology, effects of temperature, Mo. 189.
role of aphids as virus vectors on, 507.
sugar, *see* Sugar beet(s).
table, fertilizer requirements, Wis. 336.
*Bembecia marginata*, *see* Raspberry root borer.
Bentgrass scald, Wis. 334.
Bentonite suspensions, properties, effect of iron on, 167.

Benzol and related compounds, principles involved in their use, 72.
Beriberi—
acute, pathology of, 425.
control, relation to new chemistry of vitamin $B_1$, 425.
patients, urinary excretion of vitamin $B_1$ by, 279.
Bermuda grass—
constituents, relation to nitrogen, phosphoric acid, and lime in, 743.
pastures, rotational v. continuous grazing, S.C. 535.
sod, seedings of small grains and legumes on, Tenn. 481.
Berries, *see* Fruits, small, *and* Raspberries, Strawberries, *etc.*
*Bertiella studeri* development, 821.
Beverages, carbonated, value in diet, 270.
Bibliography of—
allergy in domestic animals, 686.
aphids from *Rubus* in Great Britain, 798.
bedbug, toxicity of sulfur dioxide to, 798.
blood, 413.
blue stain in sapwood, 362.
catalysts, catalyst-modifiers, life and specificity of vital processes, 462.
cold resistance in plants, 600.
coloration, adaptive, in animals, 514.
cotton picking machinery, U.S.D.A. 831.
cyanide compounds used as insecticides, U.S.D.A. 217.
dung insects, 517.
Dutch elm disease and causal agents, 215.
elements, minor, relation to plant and animal nutrition, 748.
farm tenancy in United States, U.S.D.A. 554.
fauna of the soil, 516.
food supply, world, U.S.D.A. 555.
forest products, cooperative marketing, U.S.D.A. 407.
fowls, seasonal metabolic and endocrine rhythms in, Mo. 672.
fungi imperfecti, 596.
grain beetle, saw-toothed, development and survival, 803.
helminth parasites and parasitic diseases of sheep in Canada, 248.
helminth parasites of Australia, 395.
helminths of ducks, 401.
insect biology, 522.
insects, auditory perception in, 523.
insects, toxicity of nicotine to, 653.
land classification, U.S.D.A. 554.
lice, sucking, 524.
lymphadenosis in a cow, 247.
lysimeters, construction and performance, U.S.D.A. 741.
meteorological literature, 446.
oil-producing plants, important pests of, 218.
orange pest control, 795.
Pacific Northwest, 699.
potash as plant nutrient, 744.
*Pseudomonas tumefaciens*, active immunity of plants against, 204.
Bibliography of—Continued.
rabbit parasites, 791.
rattlesnakes, 516.
red scale, California, increasing effectiveness of oil sprays, 89.
riboflavin, 421.
rose leaf beetle, 376.
Scolytoidea, 226.
scorpion flies, 524.
seed-corn maggot damage to potato seed pieces, prevention, U.S.D.A. 225.
sparrow, English, economic status in United States, U.S.D.A. 793.
spray residue tolerances, 219.
stem rust of cereals, 350.
tapeworms, poultry, intermediate hosts, 255.
tree-ring analysis, 740.
tuberculosis in man and animals, 395.
vitamin, $B_6$, 422.
vitamin E, 423.
white grubs, biology and control, Ky. 800.
wind erosion and sand dune control, U.S.D.A. 549.
wood and wood products, mechanical properties and structural uses, U.S.D.A. 403.
Big-eyed bug bites man, 363.
Big Horn River, water of, Wyo. 454.
Bindweed—
control, Nebr. 760, Nev. 481, Wash. 185, Wis. 333.
control with herbicides, N.Mex. 49.
eradication activities in 1939, 770.
eradication, mechanical equipment for, Nebr. 828.
roots, organic reserves in, 623.
Biochemistry, comparative, taxonomic significance, 467.
Biological—
materials, electron bombardment of, 457.
materials, very small amounts, spectrochemical analysis, 437.
symposia, 753.
Bios, Wildiers', notes, 468.
Birch redbeart, Me. 344.
Birds—
as possible reservoirs of equine encephalomyelitis, 107.
as transmitters of helminth parasites to domestic stock, 685.
attracting, 215.
fish-eating, 821.
game, field method of analyzing food of, 791.
Japanese, eggs of, 516.
mixed excrements of, uric acid determination, 153.
of British Columbia, ectoparasites of, 364.
of Buckeye Lake, Ohio, 515.
of Montana, blood parasites from, 516.
song, a venture in management, 793.
speciation phenomena in, 754.

Birds—Continued.
yield of weed crops and waste grain as food for, Wis. 83.
Bismuth, antispirochetal action in vitro, 822.
Bittacidae, North American, biology and morphology, 524.
Black Hills beetle, studies, U.S.D.A. 84.
Black hunter, most common predaceous thrips in North America, 655.
Black scale—
eggs, toxicity of hydrocyanic acid to, 89.
frequency distribution, 83.
winter mortality on oranges in California, 657.
Black vine weevil control, Wash. 217.
Blackberries—
Brainerd, in central Illinois, 495.
breeding, 59, N.J. 628, West.Wash. 190.
tartaric acid determination in, 269.
varieties, Fla. 624.
variety tests, West.Wash. 190.
Blackhead in turkeys, control, 401, Mo. 242.
Blackleg—
and associated conditions of cattle, 823.
in Sao Paulo, etiological agents, 396.
Bladder, human, recovery of vitamin C from, 569.
*Blatella germanica*, *see* Cockroach, German.
*Blissus*—
*hirtus*, *see* Chinch bug, hairy.
*leucopterus*, *see* Chinch bug.
Blister beetle—
ash-gray, control, S.Dak. 801.
spotted, control, S.Dak. 801.
Blister beetles, control, S.Dak. 801.
Bloat—
in cattle, factors relating to, 674.
in dairy cattle, 536, S.Dak. 246.
Blood—
and anemia studies, Hawaii 562.
and blood-forming organs, symposium, 242.
ascorbic acid in after oral administration of vitamin C, 422.
cell volume, capillary hematocrit method of determining, Hawaii 562.
clotting disturbance in obstructive jaundice and its elimination by vitamin K therapy, 285.
coagulation problem, status, 243.
cocarboxylase in, 419, 420.
constituents, cellular, of guinea pig, effects of vitamin C deficiency and diphtheria toxin, 570.
constituents of nonlactating Red Scindi cows, quantitative data, 233.
fat procedure, Allen, modification of, 674.
human, cocarboxylase content, 439.
neutral fat glycerol in, determination with periodate, 301.
nicotinamide and cozymase in, 714.
of cattle, use of cellular antigens for determining parentage, 608.
Blood—Continued.
of newly hatched chick, lipid content and changes during first month of life, 390.
oxalated, use for cytological studies, 541.
picture in hemorrhagic anemia, Minn. 140.
picture of horse, 250.
pyruvate levels in animals and man, 133.
pyruvate, relation to cardiac changes, 133.
regeneration, *see* Hemoglobin.
review of literature, 413.
values, survey, of young men and women, Hawaii 562.
vitamin A and carotinoid in, determination, 297.
Blowfly populations, winter, and activity relation to carcass temperatures, 92.
Blueberries—
breeding, fruitfulness, and use of growth substances, Me. 335.
cultivated, inheritance of characters in, 631.
culture, Mass. 771, Wash. 190.
fertilization, N.J. 628.
frozen, behavior of micro-organisms in, 154.
high-bush, improved varieties, culture, N.Y.State 340.
high-bush, nutrition, Mass. 771.
high-bush, pollination, 776.
irrigation and frost control, Wash. 190.
low-bush, pruning, 630.
mulching v. cultivation for, N.J. 628.
new interest in, N.Y.State 776.
propagation and culture, N.H. 772.
pruning and spacing, N.J. 628.
varieties, Ga.Coastal Plain 625, N.J. 628.
variety tests, West.Wash. 190.
Blueberry—
cuttings, rooting, effect of growth substances, 631.
diseases, studies, N.J. 635.
fertilizer distributor, mechanical, N.J. 687.
insects, N.J. 651.
maggot, studies, Me. 364.
thrips, studies, Me. 364.
twig blight fungus, development of perfect stage, 357.
wilt, associated with *Phomopsis*, Mass. 783.
Bluegrass—
breeding, Ky. 479.
in mixtures, effects of legumes on, Ky. 479.
parthenogenesis in, cytology, 472.
pasture v. rye for breeding ewes, Ky. 528.
pastures, continuous v. rotational grazing, Ky. 528.
pastures, white grubs in, 55.

Bluegrass—Continued.
sod, density and productivity, factors affecting, Mo. 185.
*Bluestem grasses, constituents, relation to* nitrogen, phosphoric acid, and lime in, 743.
Bobwhite, *see* Quail.
Body louse control, 524.
*Boletus elegans* in pure culture, studies, 323.
Bollweevil—
*control on upland and sea-island cotton*, Ga.Coastal Plain 654.
studies, S.C. 518, U.S.D.A. 84.
Bollworm—
injury, important period of, Ark. 84.
pink, P.R.Col. 651.
pink, larval diapause, in Trinidad, 223.
pink, primary external parasite of, biology, 379.
pink, studies, U.S.D.A. 84.
studies, U.S.D.A. 84.
*Bombyx mori*, see Silkworm.
Bone meal v. no bone meal for dairy cattle, Pa. 814.
Books on—
agriculture, history of, in Europe and America, 559.
bacteriology, 677.
butter industry, 818.
canned food, 701.
church in rural life, 842.
coloration, adaptive, in animals, 514.
diabetics, manual for, 563.
farm management, elements of, 559.
farming, practical, for beginners, 559.
fermentation and micro-organisms, 752.
hawks in the hand, 514.
horse breeding, 235.
horses, western types and training, 236.
lice, sucking, 524.
meteorology, 156.
micro-organisms and fermentation, 752.
North Carolina State College of Agriculture and Engineering, 559.
organisms, pathogenic, genetics of, 41.
plant microtechnic, 464.
plant physiology, 597.
plants, transverse reactions of, 597.
rural community organization, 842.
sedimentation principles, 161.
sociology of rural life, 122.
trees and shrubs hardy in North America, 497.
weather in the making, 156.
weeds of United States, 623.
Bordeaux mixture—
fixed copper substitutes for, Ohio 501.
toxicity, Hawaii 501.
Boric acid, biological action, 451.
Boron—
and indoleacetic acid, interrelations in effects on plant growth, 172.
behavior in soils, U.S.D.A. 314.
colorimetric microdetermination, 151.
content of Okanagan soils, 451.
deficiencies, as revealed by plant and soil tests, 451.
Boron—Continued.
deficiencies in Connecticut, 207.
deficiency and excess, effect on plants, *205, 349.*
deficiency disease of apple, 355.
deficiency symptoms, prevention by direct application of boric acid to shoot, 508.
determination in plant materials, Ky. 436.
in animal nutrition, 531.
problems of apple orchards, 508.
relation to auxin formation in plants, 172.
relation to sugar beet heart rot, 507.
requirement of canning beets, Mich. 489.
role in animal nutrition, Wis. 95.
studies with cotton and radish, N.J. 597.
test, new, Wis. 306.
treatment and crop growth, Del. 22.
Botanical terminology, German-English, 32.
Botany, advances in, 595.
Botany, teaching aids in, 745.
Botfly, throat, habits of larvae in mouth of horse, 373.
*Botryosphaeria ribis*, notes, 510.
*Botrytis*—
and *Sclerotinia*, connection of, 468.
blight on tulips, U.S.D.A. 500.
*cinerea* blight of flax, U.S.D.A., 500.
dry rot of gladiolus corms, U.S.D.A. 68.
sp. on strawberries in transit, U.S.D.A. 500.
Botulism—
and western type equine encephalomyelitis, differential diagnosis, 251.
in equines due to contaminated drinking water and hay, 826.
in fowls, No. 685.
type C in minks, 686.
*Bouteloua curtipendula*, disease of, 504.
Boutonneuse fever, relation to other rickettsial diseases, 820.
Boys—
from birth to age of 5 years, progressive skeletal development, scale for rating, 275.
growth during adolescence, relation to change in basal metabolism, 270.
Boysenberry—
culture, Hawaii 488.
testing, Ohio 488.
Brachydactyly in fowls, relation to leg feathering, 327.
*Brachymeria carinatifrons*, notes, U.S.D.A. 373.
*Brachyrhinus*—
*ligustici*, *see* Alfalfa snout beetle.
*sulcatus*, *see* Vine weevil, black.
*Brachyscleroma* n.g. and n.spp., description, 804.
Bracken ferns, leaf roll disease, cause, 203.
Bramble—
diseases, virus, Wash. 202.
shoot webber, morphology and biology, 222.

Brambles, winter-injury resistance in, Ark. 57.
*Brassica*—
  seedlings, developmental studies, 604.
  species, boron deficiency in, Me. 335.
  species, noteworthy, 168.
Bread—*see also* Flour.
  consumption and composition in European countries, 272.
  flavor in, factors affecting, 268.
  vitamin $B_1$ in, 417, 418.
  wheat gluten fractionation, 581.
  white, calcium content, 847.
Breeding—*see also* Animal breeding, Plant breeding, *and specific animals and plants.*
  cooperative artificial of dairy cattle, lessons from, 178.
  structure of populations in relation to speciation, 754.
*Bremia lactucae* races and inheritance of immunity to, 355.
*Brevicoryne brassicae, see* Cabbage aphid.
Britton, W. E., biographical sketch, Conn. [New Haven] 651.
Broccoli, improvement, Mass. 771.
Bromegrass—
  breeding, Nebr. 760.
  nutritive value, 381, 383.
  Parkland, leaf pigment concentration, relation to yield in, 764.
  pasture performance and carrying capacity, Wis. 333.
  seed setting in, Nebr. 760.
Bromegrasses, annual, as invaders of sheep and cattle ranges, Nev. 481.
*Bromus marginatus*, transpiration ratio, 169.
Bronchitis, infectious, studies, R.I. 399.
Bronchopneumonia, enzootic, of dairy calves, Fla. 680.
Broomcorn silage for dairy cattle, 675.
Brown-tail moth, studies, U.S.D.A. 84.
*Brucella*—
  *abortus*—*see also* Abortion.
    antigens, determination of density, methods, 106.
    filtrable form, attempt to demonstrate, 243.
    incubating hen's egg as culture medium for, 244.
    infection in guinea pigs, treatment with M & B 693, 106.
    intradermal inoculation for determining approximate virulence, 394.
    strains, virulence for laboratory animals and pregnant cattle, 105
    wild rat as carrier, 678.
  antigen, preparation, 677.
  cells, capsules in, 678.
  cells, chemical fractions, immunizing value, 822.
  infections in animals, localization and manifestation, 822.
  infections in midlands of England, 822.
  infections in swine, genetic resistance to, 542.
*Brucella*—Continued.
  *melitensis*, vaccination of guinea pigs and sheep against, 822.
  purified antigen from, 822.
Brucellosis—
  calfhood vaccination for, 825.
  ineffectiveness of proprietary remedies and drugs, 823.
  of farm animals, Minn. 823.
*Bruchus*—
  *brachialis, see* Vetch bruchid.
  *pisorum, see* Pea weevil.
*Bryobia practiosa, see* Clover mite.
*Bryophyllum calycinum* regeneration, effect of X-rays and radium on, 37.
*Bryozoa*, replacement of fresh-water with salt- or brackish-water species, 752.
*Bubakia* genus, new taxonomy for, 204.
Buckwheat family plants, in North Dakota, N.Dak. 287.
Budmoth, eye-spotted—
  newer dormant sprays for, 367.
  spraying for, 517.
Buffalo, chromosome complement in, 826.
Buffalo grass—
  for lawns, Nebr. 483.
  inflorescence variations in, 764.
Building papers, permeability to water vapor, 687.
Bulb diseases, 514.
Bull—
  associations, cooperative dairy, U.S.D.A. 238.
  semen and spermatozoa, characteristics of individuals, Nebr. 814.
  semen, artificial vagina for controlled-temperature studies, 757.
  semen, evaluating, 178.
  semen, preservation, yolk-buffer pabulum for, 615.
  urine, androgenic fractions from, characteristics, 588.
Bulls—*see also* Sires.
  care of, for maximum crop of calves, Miss. 234.
  dairy, average useful life-span, and causes of losses, 608.
  proving at Huntley, Montana, Field Station, 608.
  young, effect of vitamin A deficiency, 675.
Bumblebees, larval pests common to nests, 94.
*Bumelia lanuginosa*, chromosome complement and its phylogenetic significance, 473.
Bunchgrass prairies of southeastern Washington, plant succession due to overgrazing in, 169.
*Bunostomum phlebotomum*, efficacy of nonconditioned phenothiazine against, 543.
Bunt, *see* Wheat smut, stinking.
Bureau of Agricultural Economics, marketing research program, relation to work of experiment stations, 693.
β-Butoxy-β¹-thiocyanodiethylether as industrial insecticide, determination of toxicity, 793.

Butter—
  and cheese industry symposium, 102.
  bacterial flora in, changes, 673.
  body of, 102.
  composition, uniformity, relation to type of churn, 673.
  consumption, means of increasing, 102.
  *copper in, determination*, 673.
  curd content, effect of neutralizers, Mich. 540.
  diacetyl and acetylmethylcarbinol in, changes in at various temperatures, 103.
  flavor, improving with starter distillate, 103.
  flavor, relation to diacetyl and other α-dicarbonyl compounds, Iowa 103.
  grading, Government, 102.
  industry, textbook, 818.
  keeping quality, effect of treating parchment wrappers with oat flour, Wis. 101.
  keeping quality, factors affecting, 102.
  keeping quality, summary of common defects in, 818.
  making, fat losses in, 241.
  making, high-temperature pasteurization of cream for, 536.
  making, optimum butterfat content of cream for, Wis. 101.
  making, use of propionic acid or propionates in, Wis. 101.
  making, vacreation of cream for, 391.
  manufacture, survey of recent studies, 102.
  marketing by cooperative creameries in Middle West, 839.
  of high vitamin A value, vitamin A requirements of cows for, 675.
  phosphatase values, factors affecting, 673.
  production, consumption, exports, and imports, U.S.D.A. 556.
  qualities and flavor defects, relation to acid number variations, 104.
  quality improvement, Mo. 238.
  rancidity, relation to volatile acidity of fat, 537.
  salted, keeping quality, relation to acid values and acid ratios, 818.
  vitamin A determination in Pulfrich photometer, 727.
Butterfat—
  acid numbers, variations in, 393.
  carotene content, effect of silages and of sweetpotato flour, S.C. 535.
  losses in churning, 103.
  percentage and milk yield, coefficient of correlation, 539.
  percentage, prediction methods, in Ayrshire cattle, 608.
  production, relation to fat in ration, 675.
Butterflies of New Jersey, 222.
Buttermilk, cultured, effect of standardizing acidity, 674.
*Byturus unicolor, see* Raspberry fruitworm.
Cabbage—
  aphid control by derris-nicotine dust, Wis. 364.
  bacteriology, 436.
  caterpillars, commercial control near Charleston, S.C., 657.
  clubroot control, Wis. 345.
  *culture experiments*, Ga.Coastal Plain 625.
  effect of position of seedstalk on time of flower stalk development in progeny, Del. 57.
  fertilization, Ill. 336.
  fertilizer and soil management studies, R.I. 337.
  fertilizer experiments, Ga.Coastal Plain 625.
  insects, combined derris-nicotine dusts for, 363.
  insects, control, N.Y.State 794.
  insects, studies, S.C. 519.
  looper, insecticide tests for, Ohio 518.
  looper, studies, U.S.D.A. 84.
  maggot control, Mass. 796.
  maggot, timing experiment leading to control program for, 364.
  manure experiments with, Ark. 626.
  response to superphosphate, 57.
  *Sclerotinia* on, U.S.D.A. 68.
  strains, new, work progressing on, N.Y.State 191.
  varieties for disease resistance and fertilizer needs, Mo. 190.
  varieties, new, tests, 191.
  variety tests, Ga.Coastal Plain 625, Ohio 488.
  vitamins in, effect of winter storage, Mont. 276.
  white butterfly, migrations, 222.
  yellows-resistant varieties, suitable for New York State, N.Y.State 626.
Cabbageworm, imported—
  biological control, Hawaii 517.
  insecticide tests for, Ohio 518.
  studies, U.S.D.A. 84.
  toxicity of nicotine to, 653.
Cabbageworms, control by derris-nicotine dust, Wis. 364.
Cacao—
  shell meal, vitamin D and riboflavin activity of, Mass. 813.
  swollen shoot disease transmission, 358.
*Cacoecia*—
  *cerasivorana, see* Ugly-nest caterpillar.
  *fumiferana, see* Spruce budworm.
Caddice fly and its hymenopterous parasite, rearing, 228.
Cadmium poisoning, experimental chronic, 426.
Cakes—
  *sponge, effect of dry milk solids on keeping quality and batter stability*, Minn. 411.
  sponge, failure at higher altitudes, improper mixing as cause, Colo. 848.
  test, standardization of scoring, 411.

Cakes—Continued.
yellow sponge, preparing and baking at different altitudes, Colo. 268.
Calciferol, ultraviolet absorption of, 437.
Calcium—*see also* Lime.
and phosphorus, metabolism, 562.
arsenate, preparation for use as orchard insecticide, 86.
balance in preschool children, 273.
blood, in dogs, variations with age, 669.
citrate uroliths on low phosphorus diet, 129.
content of white bread, 847.
cyanamide, decomposition on soil surface, Mo. 189.
deficiency, effect on pea roots, 644.
fate after intravenous administration to adults, 414.
in blood of young colts, 810.
in human diet, approximation of calculated to determined values, 845.
in serum of ruminants, physicochemical state, 232.
in vegetables cooked in fat, 273.
in very small amounts of biological materials, spectrochemical analysis for, 437.
requirements of tropical population, adaptation to low calcium intake, 846.
resorption in intestine of rats under action of fats, 415.
retention, by rat in presence and in absence of vitamin C, 570.
California Station, notes, 144.
California University, notes, 144.
*Calliephialtes dimorphus*, biology, 379.
*Calomycterus setarius*, notes, Conn.[New Haven] 652.
Calves—
beef, and yearlings, comparison of silages for wintering, Fla. 666.
beef, molasses as substitute for corn for, Mo. 229.
beef, silage crops for, yield and palatability, Del. 94.
beef, wintering, test of various rations, Wyo. 530.
blood picture in health and under parasitism, 109.
blood plasma magnesium in, seasonal variations, 239.
changes in pH and in bacterial count of milks sham fed to, 675.
creep-fed, feeder, and lot-fattened, relative merits of producing, W.Va. 233.
dairy, dry-feed systems of raising, N.H. 814.
dairy, fed only alfalfa hay and milk, rate of development, Mo. 238.
dairy, ration for inducing rapid growth in, Mo. 238.
fed different levels of milk proteins, physiological responses, 238.
growth rate on different rations, U.S.D.A. 676.
Calves—Continued.
heifer, grain in pellet form v. meal for, Ohio 535.
heifer, raising on limited whole milk, Ohio 535.
identical twin, description, Wis. 42.
milk for, open-pail v. nipple-pail methods of feeding, S.C. 535.
on low potassium rations, electrocardiographic changes in, 807.
purified diet studies with, 675.
steer, finishing in dry lot, Iowa 96.
veal, feeding milk fat substitutes to, Ohio 535.
wheat bran v. alfalfa hay v. cottonseed meal as protein supplements to silage in winter rations, 384.
wintering, feed requirements, Ga.Coastal Plain 666, Nebr. 805.
*Camassia esculenta*, disappearance following burning over of its prairie-meadow habitat, 168.
Camellia—
flower blight, 80.
insect pests, control, Ala. 519.
scale, notes, Ala. 519.
Camera, inexpensive microphotographic, 746.
*Campcloma* sp., life cycle and other aspects, 522.
Canary pox, treatment, new and effective method, 113.
Cancer in cow's udder, extreme rarity, 815.
Cancer of mammary gland in mice, 183.
Cane fodder and alfalfa hay, relative net energy values, 382.
Cankerworm, spring, control, Mo. 90.
Canned food reference manual, 701.
Cantaloup, *see* Muskmelon(s).
*Capillaria perforans*, redescription and new hosts, 400.
*Capitophorus*—
*fragaefolii*, *see* Strawberry aphid.
*ohioensis* n.sp., description, 798.
Capons, production, N.Dak. 99, S.Dak. 533.
Carbohydrates—
in plant material, methods of determination, comparison, Mo. 153.
indigestible, of feeds, 231.
Carbon—
activated, as catalyst in oxidation-reduction reactions, 8.
dioxide assimilation, light and temperature retardation in, 33.
dioxide assimilation, nature of light and temperature optima in, 32.
dioxde gas, method for supplying to culture tubes, 678.
disulfide as soil fumigant for woolly apple aphid, 221.
in soils under different treatment, Mo. 159.
monoxide poisoning of chicks and poults in poorly ventilated brooders, 253.
tetrachloride emulsion, anthelmintic action, 678.

Carborundum for plant virus inoculations, 72.
*Carmine, effect on gastrointestinal motility* of children, 128.
Carnation cuttings, *Alternaria* branch rot on, effect of treatments, 214.
Carnations—
greenhouse, onion thrips on, Wash. 217.
physiological disorders, Mass. 771.
subirrigation method of supplying nutrients to, N.J. 631.
Carotene—
and vitamin A in milk, determination, 668.
and vitamin A, relation to serum lipids, 564.
and vitamin C in forage crops, 745.
*determination* with photoelectric colorimeter, 729.
*effect of* sweetpotato carbohydrates on determination, S.C. 439.
for chickens, sweetpotato flour as source, S.C. 529.
in forage crops during growing season, 814.
in fresh and frosted peas, 277.
in fresh and frozen vegetables, determination, 455.
in green and mature soybeans and cowpeas, 130.
*in milk, effect of feeding pea vine silage*, 815.
*in nutrition of dairy cattle*, 99.
in Oklahoma feeds, Okla. 668.
in plant tissue, determination, Mich. 438.
β-, in raw and cooked vegetables, 707.
photocolorimetric determination in human plasma, 708.
picture in serum, pathogenic and diagnostic significance, 709.
production in plants, seasonal variations in, 317.
*use, as affected by dietary factors* and variations in light exposure, 707.
utilization, effect of certain fats, 668.
*Carotinoid in blood, determination*, 297.
Carpet beetle control, traps and flypaper for, Wis. 864.
Carpet grass—
fertilizer experiments, Fla. 616.
yield and composition, relation to fertilizers, Fla. 49.
*Carpocapsa pomonella, see* Codling moth.
*Carpocapsa pomonella simpsonii*, notes, 652.
*Carpophilus hemipterus, see* Dried-fruit beetle.
*Carposina adreptella*, morphology, life history, and habits, 222.
Carrot—
family, North Dakota plants of, N.Dak. 863.
*Macrosporium* leaf blight, a menacing disease, Wis. 345.
*yellows, a menacing disease*, Wis 345.
Carrots—
*breeding*, Nebr. 771.
Chantenay, vitamin A values, Tenn. 564.
Carrots—Continued.
*grown in colloidal clay, effects of* controlled calcium supply on, U.S.D.A. 772.
grown in sand cultures under glass, effects of deficiency of essential elements, 336.
improvement, Mass. 771.
orange-fleshed, descriptions of types of American varieties, U.S.D.A. 627.
*Carts, rubber tired, home-made*, S.Dak. 403.
Casein—
manufacture, continuous-process method, 241.
proteins, biological value, 530.
Cassava—
bread, P.R.Col. 581.
fertilizer experiments, P.R.Col. 617.
Castor-beans—
culture, S.C. 488.
production, Miss. 58.
*variety tests*, S.C. 480.
Castration, effect on body weight and length of male rats, 330.
Catalase, crystalline, studies, 297.
Cataract—
nutritional, cause and control, Mass. 843.
production in rats, relation to skim milk feeding, 283.
Catalysts, catalyst-modifiers, life and specificity of vital processes, 462.
Cats—
*immature female, effect of male urine* extract, 328.
induction of mating and ovulation with pregnancy urine and serum extracts, 828.
prenatal growth, weights of organs, relation to adult weight, 47.
Cattle—*see also* Calves, Cows, Heifers, Livestock, *and* Steers.
baby beef, enterprise in southern Iowa, Iowa 552.
*basal energy metabolism, diurnal variations* in, Mo. 238.
beef—
accuracy of scoring certain characters in, 381.
feeding experiments, Hawaii 808, Kans. 384.
improvement of herds through use of purebred sires, Fla. 666.
industry in Florida, history, 669.
pasture fattening, value of cane mo*lasses for*, Hawaii 528.
breeding, giving impetus to, 475.
consistently *giving low titer reactions to* Bang agglutination test, Mo. 242.
crosses between Holstein-Friesian and Brown Swiss, color genes in, 609.
dairy—*see also* Cows.
bone meal v. no bone meal for, Pa. 814.
breeding efficiency, factors affecting, 608.
*developing strain* for high production, Mo. 238.

Cattle—Continued.
dairy—continued.
differences in production level, Wis. 42.
effect of complex mineral and vitamin mixtures, Mass. 813.
effects of inbreeding, 608.
in Philippines, 392.
inbreeding, line-breeding, and outbreeding, Wis. 42.
increase in serum magnesium during midsummer drought, 239.
inheritance of solids-not-fat percentage in, 608.
metabolism during growth, N.H. 814.
nicking in, 179, 756.
nutrition, carotene and vitamin A in, 99.
pregnancy urine extract for treatment of sterility in, 613.
production at different levels of producing ability, effect of age and dry period, 391.
purebred v. grade in dairy farming in future, 391.
reproduction in, factors affecting, Nebr. 825.
reproductive efficiency in, Ky. 815.
roughage as sole rations, Wyo. 676.
vitamin A requirements for growth, 391.
vitamin C in nutrition of, 675.
diseases, *see specific diseases.*
diminished reproductive activity, and lowered resistance to disease in, cause, Nev. 540.
effect of climate, 96.
external parasites of, U.S.D.A. 84.
fattening in Arizona, rations for, Ariz. 808.
feeding, comparison of rotation pastures with cultivated crops for, Mo. 185.
feeding experiments, S.C. 535, Wyo. 535.
fever tick, tropical variety, complicates tick eradication in Florida, 396.
fluky, treatment with Distol and kamala, Hawaii 517.
fly sprays, possibilities in India, 218.
foot rot in, Zephiran in treatment, 543.
growth in linear size and body weight, interrelations, Mo. 238.
grub, bionomics in India, 224.
grub larva, digestive enzymes of, 224.
grubs, studies, U.S.D.A. 84.
Guernsey, color pigmentation in skin and milk, and effect of feeds on, N.J. 676.
Holstein, results of continued inbreeding, N.J. 676.
methane production by, estimation, 669.
minimum lethal dose of selenium as sodium selenite, 543.
nicotinic acid and grass juice factor requirements, 382.
parasites of, P.R.Col. 677.
poisoning, *see* Livestock poisoning, Plants, poisonous, *and specific plants.*

Cattle—Continued.
range, calcium and inorganic phosphorus in blood, N.Mex. 95.
rations, mineral deficiencies in, Fla. 666.
sold for slaughter, costs and returns, N.Mex. 116.
ticks, *see* Ticks.
tuberculosis in man as source of infection, 108.
utilization of feeding stuffs by, Pa. 807.
vitamin $B_1$ deficiency in, blood picture and symptoms, 669.
welfare on Florida pastures, 234.
Cedar rust, *see* Apple rusts.
Cedar, southern white, in New Jersey, growth studies, 499.
*Cediopsylla simplex* parasite of cottontail rabbit, 791.
Celery—
diseases, control, Fla. 634.
early, response to fertilizer ingredients, 58.
greenhouse fertilizer studies, 192.
growth at different fertility levels, Fla. 625.
growth, relation to irrigation water, N.J. 625.
improvement, Mass. 771.
leaf tier, studies, U.S.D.A. 84.
mosaic, western, control, 500.
overliming injury to, N.J. 625.
packing, man-hours used in, Mass. 835.
sclerotiniose, control on Florida muck, 779, 781.
varieties, susceptibility to *Fusarium* yellows, Ohio 75.
Cell—*see also* Plant cell(s).
division in pollen tube, effect of colchicine, 753.
division, mechanism and morphological bases of cytology, 170.
theory, past, present, and future, 753.
wall constituents of forage plants, development, 314.
walls, studies, 605.
Cellulose—
decomposing organisms, changes produced in bleached cotton duck by, U.S.D.A. 428.
in wood, fermentation, 468.
industry in Puerto Rico, prospects on establishment, P.R.Col. 581.
membranes from various parts of plants, 35.
Cellulosic materials, thermophilic fermentation, products and micro-organisms involved in, 456.
Centipede grass pastures, value, Fla. 616.
Cephalin, highly unsaturated, tissue content in C-avitaminosis, 570.
*Cephalosporium*—
elm wilt in Massachusetts, Mass. 790.
sp., description, 649.
*Cephalothecium roseum* extracts, vitamin C in, 598.

*Cephus pygmaeus*, see Sawfly, European wheat stem.
*Cerataphis lantaniae* on yellow dwarf coconut, P.R.Col. 651.
*Ceratophyllum*—
*demersum*, fruits and seedlings of, 606.
*echinatum*, seedlings and fruits of, 606.
*Ceratostomella*—
sp., cause of new disease of sycamore trees, 790.
sp. on plane tree, 513.
sycamore (plane tree) disease, new locations for, U.S.D.A. 500.
*ulmi*, attempts to isolate from stored elm wood, 81.
*ulmi*, host-parasite relations, 346.
*ulmi*, isolation from *Scolytus multistriatus* stored at different temperatures, 648.
*ulmi* transmission by *Scolytus* spp., 215.
*Cercaria*—
apharyngeal brevifurcate, new species, description, 244.
*wardlei*, revised description, 244.
*Cercospora*—
*apii* in pure culture, inducing spore production by, 645.
*beticola*, effect on composition and carbon assimilation of sugar beets, 641.
*cardiostegiae* n.sp., description, 202.
*cercidicola*, notes, 214.
*laburni* n.sp. from Oklahoma, description, 348.
leaf-spot disease of *Nandina*, U.S.D.A. 201.
leaf spot of peanuts, control, 780, 781.
leaf spot of zinnia, control, Fla. 634.
*musae*, notes, P.R.Col. 635.
on beets, control by spray and dust, 354.
*Cercosporella*—
foot rot of wheat, U.S.D.A. 783.
*herpotrichoides* in Pacific Northwest, U.S.D.A. 350.
Cereal—
black stem rust, relation to barberry host, N.Dak. 503.
browning root rot, studies, 640.
crops as winter pastures for swine, comparison, Ark. 94.
crops suitable for silage, Mo. 806.
diseases for Georgia, U.S.D.A. 635.
diseases in Virginia and Texas, U.S.D.A. 500.
germinating seed and young seedlings, morphological-developmental stages of, 605.
grasses, fresh extracts of, nutritive factors in, Mo. 229.
root rots, 502.
rusts—see also Rust(s) and specific hosts.
in southern Plains States, U.S.D.A. 635.
in Texas, U.S.D.A. 344.
seed treatment, see Seed treatment.
Cereal—Continued.
smuts—see also Smut and specific hosts.
notes, U.S.D.A. 782.
stem rust, summary, 350.
Cereals—see also Grain and specific grains.
African, proximate constituents and composition of ash, 699.
and cereal products, nicotinic acid in, 713.
available iron in, 704.
in fattening ration of poultry, 386.
rickets-producing acton, effect of phytin, 425, 426.
snow molds of, caused by *Typhula* spp., 73.
use of commercial fertilizers for, Nebr. 741.
vitamin $B_1$ assays, 132.
Cerebrospinal fluid pressure and vitamin A deficiency, 675.
*Ceuthorhynchus assimilis*, biology and control, 218.
Cevitamic acid, see Ascorbic acid.
*Chaetocnema pulicaria*, see Corn flea beetle.
*Chaetodacus tryoni*, toxicity tests, 799.
*Chaetomium globosum*, changes produced in bleached cotton duck by, U.S.D.A. 428.
Chaff scale on camellia, Ala. 519.
Chagas' disease, susceptibility of natural vectors to experimental development of, 820.
*Changa*—
of Puerto Rico, parasite of, 83.
specific parasite of, establishment in Puerto Rico, P.R.Col. 651.
Chaparral shrubs, stem anatomy of, 606.
Cheese—
and butter industry symposium, 102.
blue, effect of salting curd for, 104.
brick, changes during manufacture, 673.
brick, starter combinations for, Wis. 101.
Cheddar—
bitter flavor development in, relation to salt, 674.
curing, changes for study, 674.
pasteurized milk in manufacture, 103.
ripening, effect of lipolytic enzymes, 674.
cottage—
effect of standardizing acidity, 674.
homogenized milk in manufacture, 674.
quality improvement, Mo. 238.
flavor, body, and texture, factors affecting, 103.
foreign, studies, 103.
foreign varieties, manufacture, ripening, and development, Wash. 238.
grading, points observed in, N.Y.State 241.
hard, new types, development, 103.
industry, "just salt" obsolete in, N.Y. State 818.
Italian, industry growing in New York State, N.Y.State 241.

Cheese—Continued.
making, 104.
making, laboratory tests necessary, 103.
making, producing milk for, 103.
production, consumption, exports, and imports, U.S.D.A. 556.
quality, means of improving, 103.
score value and serving properties, effect of temperature, 674.
skipper, primary parasite of, biology, 227.
sliced Cheddar and Swiss, packaging in cans for sandwich dispensers, U.S.D.A. 818.
soft, fat, moisture, and salt in, determination, 301.
Swiss—
activity of starters, effect of heat-treatment of milk, 673.
control of fat content, Wis. 101.
fat in, standardization and relation to quality, 674.
manufacture, control of abnormal bacterial fermentations in, 673.
quality improvement, 674.
starters, preparing, storing, and using, Wis. 101.
types, making, tests of milk for, Wis. 117.
types, suitability for frozen-pack methods of storage, Wash. 238.
*Chelonus texanus*, notes, 799.
Chemical calculations, elementary, mathematics of, Minn. 293.
Cherries—
brining, cracking problem in, 155.
factors limiting production in Missouri, Mo. 189.
losses from plant diseases, U.S.D.A. 201.
Montmorency, effect of sprays on size, color, and per cent solids of fruit, 493.
Montmorency, frozen, industry, N.Y.State 772.
new hardy for Northwest, S.Dak. 774.
pollination, 194.
pruning, Iowa 491.
quality, reliability of retail prices as guides to, Ohio 116.
rootstocks for, Ark. 57.
sour, destructive bud-transmissible disease called physiological yellow leaf, 789.
vitamin C in, 715.
Cherry—
aphid, black, tests with insecticides for, Wis. 364.
canker, studies, Mo. 201.
casebearer, tests with insecticides for, Wis. 364.
fruitfly, black, control, spray residue and substitutes for lead arsenate in, 660.
fruitfly control, spray residue and substitutes for lead arsenate in, 659.
fruitfly situation, Hood River County, Oregon, 795.
fruitworm, life history and control, Wash. 217, West.Wash. 217.
Cherry—Continued.
fruitworm on blueberries, N.J. 651.
juice products, improved, formulas and methods for preparation, Colo. 843.
leaf spot, bordeaux best remedy, Wis. 345.
leaf spot, fungicidal control, N.J. 635.
sour, boarder tree or physiological yellow leaf of, Wis. 345.
trees, young, importance of soil pore space to, N.Y.State 194.
Chess—
downy, hazard of basing permanent grazing capacity on, 50.
or cheat control, Mich. 50.
Chestnut—
blight eradication, 500.
blight, relation to principle of disease resistance, 215.
seeds, viability, effect of storage conditions and other treatments, Ark. 65.
Chick—
antidermatitis factor, 667.
embryo development, effect of temperature shock, 386.
embryo, unincubated, development, relation to hatchability of egg, 386.
embryo vaccine, reactions in horses following inoculation, 680.
embryos, Cornish lethal and creeper compared with normal sibs, glutathione values, 44.
losses due to faulty ventilation, 253.
Chicken—
dressed, precooling, freezing, and storage, 388.
meat, market quality, factors affecting, 533.
meat production, efficiency in, N.J. 390.
mite, notes, 400.
palatability, effect of drawing before freezing, 388.
squab, preparing and serving, 388.
Chickens—*See also* Chicks, Cockerels, Fowls, Hens, Poultry, *and* Pullets.
broiler, development of economical rations, Ark. 94.
broiler industry, economic study, Ind. 263.
broiler production, cottonseed meal and shrimp meal as protein sources, Miss. 666.
broiler production, cross-breeding for, Ark. 94.
broiler production, early, liberal amounts of animal protein for, Wis. 382.
broilers, optimum protein levels in rations, Del. 95.
coryza in, vaccination for, Wyo. 541.
holding prior to evisceration and freezing, problems arising during, 388.
squab, outlet for excess cockerels, 387.
squab production, improved, breeding and feeding for, N.J. 671.
table, creation of reserves in, purpose and technic, 387.
undrawn, quality, effect of time and temperature of holding, 388.

Chicks—
- additional factors required by, 667.
- alcoholic precipitate factor required by, complex nature, 668.
- and laying hens, protein requirements, Wash. 229.
- body weight and feather growth in, effect of whole wheat, bran, and shorts, Nebr. 533.
- carbon monoxide poisoning due to poorly ventilated brooders, 253.
- care and management, N.J. 390.
- day-old, sex determination, 611.
- day-old, vaccination for control of fowl pox, Hawaii 518.
- deformity called crooked toes in, cause, 534.
- electric brooding of, Mo. 255.
- embryonic development, effect of riboflavin deficiency in hen, 390.
- fat requirements, 672.
- feather development, effect of protein level in ration, Del. 95.
- fed simplified diets, growth, effect of yeast extract and other supplements, 383.
- feed requirements for development of gizzard lining, 386.
- free-choice feeding v. all-mash feeding for, Ky. 528.
- growth and yolk absorption, effect of cold drinking water, 533.
- growth rate, Mo. 229.
- injected with testosterone propionate, follicle and comb development in, 332.
- injury by boric acid, Wis. 382.
- new growth factor requirement, essential nature, 533.
- newly hatched, lipid in blood, liver, and yolk sac and changes in first month, 390.
- protein requirements, 386.
- relation of gain in weight to gain in energy, 98.
- slipped tendon in, cause and prevention, Okla. 812.
- slipped tendon in, use of manganese by, Wis. 95.
- ulcerated gizzards in, relation to vitamin C in diet, N.H. 805.
- vitamin A requirements when fed as carotene, Tex. 390.
- year-round hatching, practicability, N.J. 671.

Children—*see also* Boys, Girls, *and* Infants.
- Chinese, basal metabolism, 412.
- dependent, in South Dakota, S.Dak. 410.
- gastrointestinal motility, effect of carmine, 128.
- in selected communities, food habits and nutritional status, Me. 410.
- preschool, calcium, phosphorous, and nitrogen balances, 273.
- preschool, hemoglobin and blood cell levels, Hawaii 562.
- school, importance of dairy products in diet, 412.

Chilies—*see also* Peppers.
- mutation in, 491.
- variety tests, N.Mex. 57.

Chimeras, induced periclinal, use in determining constitution of organs and origin from germ layers in *Datura*, 456.

Chinch bug—
- bionomics and control, Iowa 85.
- control, Mo. 217, Nebr. 87.
- false, egg parasite of, 804.
- hairy, control, 87.
- losses, prevention, Ill. 656.
- resistance of $F_1$ sorghum hybrids to, 220.
- studies, Nebr. 796.

*Chionaspis furfura*, *see* Scurfy scale.

*Chlamydomonas*, new growth factors, 468.

Chlorazol black E as aceto-carmine auxiliary stain, 465.

*Chlorella*—
- rate of photosynthesis, effect of magnesium deficiency, chlorophyll concentration, and heat treatments, 175.
- *vulgaris*, growth in freshly prepared medium, effect of size of inoculum, 39.

Chlorine, available, rapid multiple color test for approximation of, 536.

Chlorophyll—
- as prosthetic group of a protein in green leaf, 34.
- in plant tissue, determination, Mich. 438.

Chloropicrin in soil solution, effect on plant growth, 173.

Chloroplast, structure, and location of chlorophyll in ferns, 602.

Chloroplasts, studies, 34.

Chlorosis—
- control, N.Mex. 69.
- in corn, Fla. 616.
- in corn and other field crops, Fla. 634.
- in cottonwood trees, ferric phosphate control, Wyo. 502.
- of baldcypress, control, effect of ferric chloride, 513.
- of Concord grapes controlled by grafting, Utah 357.

*Choanotaenia infundibulum* of poultry, intermediate hosts, 255.

Chocolate milks, physical characteristics, factors affecting, 104.

Chokecherry leaf curl, new disease, U.S.D.A. 500.

Cholesterol—
- determination, 725.
- feeding to guinea pigs, blood and tissue changes produced by, nature, 668.

Cholic acid in dogs, intravenous fat not a precursor, 667.

Choline metabolism, 845.

Choriomeningitis, lymphocytic—
- immunity of mouse to, 820.
- soluble antigen of, 820.

Chromosome sensitivity to X-rays, changes in, 753.

Chromosomes—
- cleavage, synthesis of, 326.
- in buffalo, studies, 326.

Chromosomes—Continued.
in mammals, smear method of counting, Mo. 182.
numbers in species of British plants, 606.
of fowls, linkage map for, 609.
sex, in fowls, linkage data, 181.
structure, symposium on, 753.
Chrysanthemum—
foliar nematode, inefficacy of methyl bromide fumigation, 649.
gall midge in England, biology, 799.
leaf blight, status of, causative agent, 214.
*Verticillium* wilt, roguing and selection for control, Ohio 501.
Chrysanthemums—
fumigation injury, 649.
made to bloom earlier or later, Miss. 496
novel species, 168.
testing, N.Mex. 57.
*Chrysomphalus*—
*aonidum*, *see* Red scale, Florida.
*aurantii*, *see* Red scale, California.
*Chrysomyia rufifacies*, life history and bionomics in India, 373.
Church in rural life, treatise, 842.
*Chusquea* new species, 597.
Chytridiales, sexuality in, 468.
Cider preservation experiments, Ohio 439.
*Cimex lectularius*, *see* Bedbug.
*Cirphis unipuncta*, *see* Armyworm.
*Citrobacter freundii*, preparation of an active juice from, 607.
*Citromyces ramosus* extracts, vitamin C in, 598.
Citrus—
areolate leaf spot, cause, 80.
byproducts, utilization for poultry, Fla. 666.
canker eradication, U.S.D.A. 68.
cold storage, Fla. 624.
culture, Fla. 625.
culture in California, 630.
dieback and scab, control, Fla. 634.
diseases of Texas, 790.
exchange system of Florida, Fla. 121.
fruit set, effect of spring soil moisture on drop, 495.
fruits—*see also* Lemon(s), Orange(s) *etc.*
melanose and stem-end rots of, Fla. 634.
studies, P.R.Col. 625.
varieties, Ga.Coastal Plain 625.
yield and composition, effect of type and treatment of soils, Fla. 592.
gummosis and psorosis, Fla. 634.
juice and pulp, preservation, Fla. 624.
meal for poultry, 386.
meal, use as swine feed, Fla. 666.
nutritional requirements, Fla. 625.
physiology of maturity processes in, Fla. 624.
psorosis, 500.
psorosis, nature and cause, 358.
Citrus—Continued.
pulp as carrier for molasses in preserving grass silage, N.J. 676.
red mite on Satsuma orange, control, Ala. 794.
root rot, control, Fla. 634.
rootstocks for, Fla. 625.
rust mite, cost of control measures, 379.
rust mite on Satsuma orange, control, Ala. 794.
scab disease, effect of climatic factors, 358.
soil fertility studies with, Fla. 625.
soils of Florida, chemical studies, Fla. 309.
soils, studies, Fla. 592.
thrips control, field studies, 523.
thrips on lemon and oranges, field studies on control, 219.
thrips on lemons, control, U.S.D.A. 83.
thrips on lemons, tartar emetic for control, 219.
trees, effect of manganese applications, 63.
trees, spraying, rating thoroughness of application in, 89.
variety testing and breeding, Fla. 625.
whitefly, *see* Whitefly, citrus.
*Cittotaenia variabilis* parasite of cottontail rabbit, 791.
*Cladosporium*—
*fulvum*, control, Mass. 783.
*paeoniae*, cause of peony stem spot, 359.
*Clastoptera saint-cyri*, studies, Mass. 796.
*Clausenia purpurea*, parasite of Comstock's mealybug, 657.
Clay—
samples, natural and homoionic, properties, 453.
saturated, permeability of, 453.
soils, *Azotobacter* activity, relation to surface soil acidity, N.Dak. 742.
Climate—*see also* Meteorology.
and health, quantitative physical data useful in, 739.
world, problem of, 739.
Climatological—
data, Ohio 446, U.S.D.A. 156, 446, 590.
data of Colorado, 21.
survey for Ohio and Wooster, Ohio 740.
Climatology, comparative applications to Mexico, 306.
*Clitocybe tabescens* root rot of citrus and other woody plants, Fla. 634.
*Clostridium*—
*butylicum*, preparation of an active juice from, 607.
*pasteurianum*, notes, 155.
*welchii* type C, antigenic variation in a strain, 824.
*welchii*, types A, C, and D, blood changes and post-mortem findings following inoculation of sheep with, 681.
*welchii* types in soil and in intestines of animals and man, 823.

*Clothes moth larvae, minimum size of openings through which they pass*, 652.
Clothes moths control, traps and flypaper *for*, Wis. 364.
Clothing costs of different sized and different age groups, Ark. 142.
Cloud—
  bases, form and relative humidity gradient, 738.
  forms and states of the sky, codes for, International system, U.S.D.A. 158.
Clover—
  alfalfa-timothy seedings, mixed, productiveness, Ohio 480.
  alsike, cultural and fertilizer practices on peat land, Wis. 333.
  fertilizer experiments, Fla. 616.
  foreign, failure in 1938, Ohio 480.
  Ladino, fertilizer and cultural requirements, Me. 333.
  mite in dwellings, Conn.[New Haven] 652.
  Persian, advantage for early pasture, Miss. 617.
  red—
    adapted and nonadapted, resistance to pea aphid injury, Ky. 518.
    breeding, Ky. 479, N.J. 617.
    breeding for disease resistance, 781 Tenn. 501.
    cultural and fertilizer practices on peat land, Wis. 333.
    *cuttings, development, effect of* plant hormones, 172.
    seed, pubescent characteristic, relation *to determination of origin*, 50.
    strains, seed setting in, 765.
    *varieties, adaptation in northern* and southern Ohio, Ohio 480.
    variety tests, Ky. 479, N.J. 617, Wash. 185.
  seed crop, harvesting, Miss. 479.
  seeds, red, alsike, and white, relations of color to germination and other characters, 50.
  sweet, *see* Sweetclover.
  timothy hay, fertilizer experiment, N.H. 760.
  variety tests, Fla. 616, Tenn. 481, Wyo. 481.
  white—
    breeding, N.J. 617.
    in pasture as affected by management, Ohio 480.
    Ladino a promising strain, Ohio 480.
    strain tests, Fla., 616.
    variability in, relation to pasture improvement, N.J. 619.
    variety tests, N.J. 617.
Cocarboxylase—
  action, mechanism, 731.
  and vitamin $B_1$ in organs, determination, 712.
  in blood, 419, 420.
*Cocarboxylase—Continued.*
  in blood and tissues, quantitative determination by thiochrome procedure, 440.
  in human blood, 439.
  ultraviolet absorption spectra and their *reduction products*, 731.
Coccidial oocyst output in feeder lambs, effect of copper sulfate-ferric sulfate mixture, 248.
Coccidiosis—
  control, in wire-floored batteries and houses, Hawaii 518.
  in chickens, physiological effects, Wis. 105.
  *in chickens without gross lesions*, 827.
  in feeder lambs, 545.
  in litter of pigs, 398.
  in poultry, 547, N.H. 823, Wyo. 541.
Coccinellidae, predaceous, toxicity of calcium arsenate to, S.C. 518.
Coccus, Gram-positive—
  in birds positive to serum plate test for pullorum disease, 254.
  isolation from birds in serological tests, Wash. 242.
*Coccus hesperidum, see* Scale, soft.
*Cochliomyia americana, see* Screwworm.
Cockerels—
  excess outlet for as squab chickens, 387.
  New Hampshire, sexual behavior, 476.
  surplus White Leghorn, marketing, N.Dak. 236.
  White Leghorn, interrelation of lipids in blood plasma, 236.
Cockroach—
  auditory perception in, 523.
  German, control, N.J. 651.
  German, evaluating liquid insecticides against, 520.
  German, rate of regeneration in, 219.
Cockroaches, toxicity of phosphorus to, 86.
Cocoa—
  effect on digestibility of milk proteins, 674.
  shell meal as source of vitamin D for rats, Mass. 843.
Coconut—
  industrial utilization, P.R.Col. 581.
  oil meal for pigs, desirability of limiting, Ohio 529.
  yellow dwarf, flower buds, aphids attacking, P.R.Col. 651.
Cod roe, canned, vitamin D potency, 717.
Codling moth—
  activity of adults, 90.
  activity, variation with locality, Wis. 364.
  baits, 367.
  baits and insecticides, N.Mex. 85.
  biological control, 658, N.J. 651.
  bionomics and control, Del. 85.
  control, 366, Ky. 518, Mo. 217.
  control by electric and other traps, 524.
  control, fundamentals, 518.
  control, group action in, 367.

Codling moth—Continued.
control, how to use nicotine and oil for, 367.
control, practical supplementary measures, 524.
control, studies, U.S.D.A. 83.
control with chemically treated bands, 799.
control with pyrethrum, 90.
end of hatching period, Ark. 84.
flight habits, effect on results of experiments, 658.
flights, effect of variety, Wis. 364.
golden, 652.
habits, newly discovered, 83.
in Indiana, status, 524.
in fruit regions of France, papers on, 223.
infestation, relation to temperature and rainfall, N.Y.State 223.
insecticides, testing, laboratory-field method, U.S.D.A. 216.
larvae, migration from one apple to another, 524.
larval attractants, studies, 370.
nonresidue sprays for, 370.
problem, extension aspects, 518.
scraping and banding as supplementary control, 367.
tolerance to toxic action of insecticides, Mo. 217.
Cod-liver oil—
feeding, effect on goaty and oxidized flavors, and vitamin C in milk, 673.
toxicity for pigs, 810.
*Coenurus glomeratus*, studies, 686.
*Coenzyme R, synthesis by Rhizobia and by Azotobacter chroococoum*, 463.
Coenzymes I and II, synthesis, 858.
Coffee—
Columnaris and Puerto Rican varieties, comparison, P.R.Col. 625.
farms, earnings on, P.R.Col. 689.
fertilizer requirements, Hawaii 488.
leaf miner, studies, P.R.Col. 651.
plant, fertilizer needs and light requirements, P.R.Col. 625.
plant, growth, relation to yield, Hawaii 488.
plant, lime requirements, P.R.Col. 625.
plant, root studies, P.R.Col. 625.
plantations, analysis of production practices, P.R.Col. 625.
prices, P.R.Col. 689.
tree seeds, Kentucky, viability, effect of storage conditions and other treatments, Ark. 65.
*Cohnistreptothrix*, taxonomic notes, 607.
*Colaspis*—
*brunnea costipennis*, studies, Mass. 796.
*favosa*, notes, Ala. 519.
Colchicine—
different forms, effect on roots of *Vicia faba*, 751.
effect on nuclear and cytoplasmic phases of cell division in pollen tube, 753.
Colchicine—Continued.
treatment of petunias, variations induced by, 473.
treatment of *Salvia splendens*, variations induced by, 473.
Cold, *see* Temperature, low.
Cold storage—
locker plants in Wisconsin, data, Wis. 117.
studies, Wash. 256.
*Coleophora pruniella*, *see* Cherry casebearer.
Coleoptera, hymenopterous parasites in Great Britain, 379.
Coli-aerogenes intermediates, dissimilation of glycerol by, 725.
Coliform—
group in ice cream, 673.
test, critical discussion, 240.
Colitis, chronic ulcerative, *Bacterium necrophorum* in, 823.
*Collabismodes cubae*, notes, Fla. 650.
College men, basal metabolism of, Wyo. 562.
Colleges, *see* Agricultural colleges.
Collembola, North American, geographical distribution, 219.
*Colletotrichum*—
fruit rot of papaya, 358.
leaf spot of Nephthytis, Fla. 634.
sp. on ornamentals, N.J. 635.
Colloidal—
behavior of soils, laws, 23.
suspensions, chemical preparation in non-aqueous solvents, 6.
Colloids, soil—
effect on toxicities of sodium selenate and *sodium selenite for millet*, 166.
hydrolysis effects, 165.
identification of minerals in, 593.
inorganic, break-down, relation to plant growth, 165.
*Collyriclum faba* infestation in purple finch, 255.
Colonization project of Sicily, U.S.D.A. 555.
Color genes in Holstein-Friesian by Brown Swiss crosses, 609.
Colorado—
College, notes, 575.
Farm Bulletin, notes, 863.
Station, notes, 575.
Coloration, adaptive, in animals, treatise, 514.
Colts—
calcium, inorganic phosphorus, and magnesium in blood serum, 810.
draft, growth, Mo. 229.
roughage for, Nebr. 805.
Communities—*see also* Rural community.
town-country, in Lansing region, mapping of areas as to services, Mich. 409.
Community—
life, American, rebuilding, 696.
organization and life, trends in, 698.
Compass, Brunton, use in Saskatchewan soil survey, 449.
Concentrates, in various combinations, feeding value for lambs, Wyo. 530.

Conifers—
damping-off of and causative fungi, effects of H-ion and Al-ion concentrations, 646.
northern, successful direct seeding on shallow-water-table areas, 499.
Rocky-Mountain, water requirements, 65.
*scale insects on, use of oil sprays for control*, 516.
vegetative propagation, 199.
wind-thrown, fungi causing decay in, 361.
*Coniothyrium fuckelii* on rose leaves, 360.
Connecticut—
State Station, notes, 288.
Stations, notes, 864.
Storrs Station, notes, 431.
University, notes, 431.
*Conoderes*—
*auritus*, notes, Ky. 518.
spp., injurious to tobacco, Ky. 376.
*Conopia exitiosa*, see Peach borer.
*Conotrachelus nenuphar, see* Plum curculio.
*Contracaecum spiculigerum*, life cycle studies, 821.
Convolvulaceae, susceptibility to big bud disease, 784.
Cooperation—*see also* Agricultural cooperation.
American, papers on, 838.
Cooperative—
associations, farmers', in Florida, Fla. 121.
creamery accounting, 695.
*egg and poultry auction associations*, 695.
elevators, salaries of managers in, Okla. 689.
exchanges, amounts and cost of credit extended by, Mo. 259.
extension work in agriculture and home economics, U.S.D.A. 698.
*purchasing by Indiana farmers*, 695.
*Cooperatives, Oklahoma farm, causes of failure*, Okla. 406.
*Cooperia* spp., efficacy of nonconditioned phenothiazine against, 543.
Copper—
as trace element, 599.
compounds, fixed, injury to vegetables, Ohio 210.
*compounds, toxicity for nematode parasites*, 245.
feeding to pregnant ewes, effect on swayback in progeny, 234.
fixed, role in stone fruit spraying, 356.
fungicides, cause of injury by, principles underlying, N.J. 635.
fungicides, fixed, new weapon against *vegetable diseases*, 511.
in blood stream, fate of, 243.
in butter, determination, 673.
in human organs at various ages, 562.
in spray residues, small amounts, determination, 584.
poisoning, acute and chronic, in animals, 681.

Copper—Continued.
poisoning, chronic, in sheep, 826.
sprays for vegetables, Mass. 783.
sulfate as anthelmintic, critic on efficacy, 678.
value in utilization of iron, Wis. 126.
Corbett, L. C., necrology notes, 576.
*Corbulopsora* n.g. and n.spp., 636.
Cormorant, nematode from, life cycle studies, 821.
Corn—
acreages reduced, compensation by growing superior hybrids and putting larger proportion in the silo, Ohio 480.
and legumes, interplanting, effect on yields of succeeding *crops*, Ark. 48.
and lespedeza hay v. cottonseed meal for fattening steers, S.C. 529.
and velvetbeans, ground v. unground mixtures, with and without molasses, for fattening steers, Fla. 666.
and wheat acreages, response to changes in ratio of corn price to wheat price, Iowa 116.
Argentinian, sterility in, 471.
Argentinian varieties, duplications of embryos in, 471.
average yields per acre in Ohio, Ohio 257.
bacterial wilt—
resistance and genetic host-parasite interactions in, 502.
*resistance in, genetics*, Iowa 68.
symptomless host plants, after inoculation by corn flea beetle, 211.
borer, European—
effect on potato yield, Conn.[New Haven] 652.
insecticides for control, Conn.[New Haven] 652, Mass. 796.
nutritive requirements, 524.
studies, Del. 85, N.H. 796, N.J. 651, U.S.D.A. 84.
bran, energy value, 382.
breeding, Ark. 48, Fla. 616, Ga.Coastal Plain 617, Ky. 479, Mo. 185, N.J. 617, Nebr. 759, P.R.Col. 617, Tenn. 481, Wash. 185.
breeding for stronger roots, Ohio 480.
carotenoid pigments, 456.
characteristics, relation to industrial utilization, Iowa 6.
check-planted, hill spacing, Iowa 113.
chromosome aberrations in endosperm, 755.
chromosome rearrangement, growth changes resulting, 456.
cost of irrigating, and increased yields, Nebr. 835.
*cribs, fumigation to prevent weevil damage*, Miss. 287.
cultivation, weed killing v. mulching, Wis. 333.
culture experiments, Ark. 48, Tenn. 481, Wyo. 481.
damage by insects, fumigation surest preventive, Miss. 143.

Corn—Continued.
*Diplodia zeae* dry rot of, Iowa 68.
diploid and tetraploid, relation between carotenoid content and number of genes per cell, 176.
disease resistance in and nature and methods of measuring, Iowa 68.
double crosses, effect of method of combining four inbred lines of on yield and variability, 755.
dried grains, distillers', and tankage v. cottonseed meal as protein supplements for fattening steers, Ky. 528.
dried grains, distillers', v. cottonseed meal for pregnant and nursing beef cows, Ky. 528.
ear rot fungi, prevalence and geographic distribution, U.S.D.A. 500.
earworm—
attack, resistance of plants to, West.Wash. 217.
control, N.Y.State 659.
control, dichloroethyl ether in mineral oil for, 652.
control in sweet corn by fumigation, U.S.D.A. 216.
effect of temperature and moisture on overwintering pupae in Northeastern States, 91.
metabolism, 371.
notes, N.J. 651, Tenn. 519.
on lima beans, studies, U.S.D.A. 84.
relation to European corn borer situation, Me. 363.
response to lights, Ohio 518.
studies, 83, Del. 85, U.S.D.A. 84.
endosperms, growth hormones in, extraction methods, 726.
fertilizer experiments, Fla. 616, Ga. Coastal Plain 617, Tenn. 481, Wash. 185.
flea beetle, inoculation of symptomless host plants with bacterial wilt, 211.
flea beetle vector of bacterial wilt, 787.
for fattening pigs, hybrid v. open-pollinated, Nebr. 805.
genetic malformation in, histology, 745.
genetic studies, Mo. 185.
gluten meal proteins, biological value, 530.
growing, with and without soybeans in drill, S.C. 481.
harvested and fed in various forms, costs and profitableness of acre-beef yields from, Tenn. 529.
hogging off, returns from, Ga.Coastal Plain 666.
hybrid, adaptation trials, Wyo. 334.
hybrid, increased yields from, Colo. 186.
hybrid, planting rates, Wis. 333.
hybrid, production, and commercial hybrid seed, La. 187.
hybrid program expansion, Ohio 480.
hybrid strains for silage production, Wis. 333.
hybrid, tests and classification, Mich. 52.

Corn—Continued.
hybrid v. open-pollinated, for swine, Ohio 529.
hybrids and varieties, yield tests, Del. 48.
hybrids, growth rate, Ohio 480.
improvement, Colo. 754.
in various forms, for winter finishing of baby beeves, Tenn. 529.
inbred lines—
composition of silks, effect of pollination, 765.
damage by southern corn rootworm, Ohio 518.
relative resistance to *Diplodia zeae*, Iowa 69.
internal grain infection and kernel rot, 352.
interplanting with—
legumes, effects, Ark. 760.
velvetbeans at various spacings, effect, Fla. 616.
Iowa, yield test, Iowa 51.
irrigation experiments, P.R.Col. 617.
Kansas, tests, Kans. 51.
kernel, amino acids in, 9.
leaf aphid, reducing injury through host resistance, 798.
linkage studies, 325.
losses from plant diseases, U.S.D.A. 201.
maturity, Mich. 483.
merits as emergency forage crop, N.Dak. 481.
Napier grass, sugarcane, and sorghum, ensiled, comparison of loss of nutrients, Fla. 666.
nutrition studies, nutrient ion concentration and carbohydrate and nitrogen in tissue, relation, 460.
on Everglade peat and muck soils, response to less common elements, Fla. 616.
open-pollinated v. hybrid, for pigs, Ohio 96.
outstanding varieties, N.Dak. 49.
pickers, efficiency, Iowa 113.
planters and listers, adjusting for sorghums, Nebr. 550.
planting, basin method on representative soil areas, Iowa 113.
planting tests, Nebr. 760.
plants and pathogens response to chemical treatments of seed, Iowa 68.
production in alluvial section, La. 187.
production in Delta, Miss. 479.
production of genetic variations by radiation of pollen with ultraviolet rays, Mo. 185.
production on hill lands, La. 187.
protein, fractionation and characterization, Iowa 6.
quality, reliability of retail prices as guides to, Ohio 116.
quick-frozen, keeping quality after thawing and storing, Wis. 126.
research in Iowa, Iowa 50.

Corn—Continued.
*root and scutellum rots, microflora of,* Mo. 201.
root webworm, studies, U.S.D.A. 84.
roots, absorption of soil moisture by, 747.
rootworm, southern, damage to inbred lines of corn from, Ohio 518.
rotation experiments under Everglades conditions, Fla. 616.
seed drying with heated air under forced draft, Nebr. 760.
seed treatments, Ark. 637.
seed treatments, effect on stand and yield, Mo. 201.
seedbed preparation, production methods and equipment, Iowa 113.
seedlings, absorption of phosphorus and sodium, radioactive isotope study, 174.
seedlings, resistance to high temperatures in laboratory tests, 52.
selfed lines, origin, relation to value in hybrid combination, Minn. 325.
silage, *see* Silage.
sirup, high conversion, use in ice cream and ices, 672.
sirups and sugar for frozen desserts, 672.
smut promycelia, delayed reduction of diploid nucleus in, 638.
smut resistance and semisterility in, linkage relations, 41.
spacing for green manure, 52.
sprouted v. dried for milking cows and growing heifers, 814.
stalk and ear rot resistant lines, inbred, development, Iowa 68.
Stewart's disease, *see* Corn bacterial wilt.
*sweet, see* Sweet corn.
uncontrolled vegetative development in, 37.
v. barley for fattening pigs on pasture, Tenn. 529.
v. blackstrap molasses in livestock ration, Miss. 805.
v. milo as main portion of lamb ration, Colo. 235.
v. sorghum grain for fattening cattle, Nebr. 805.
varieties, Miss. 185.
variety tests, Ark. 48, Fla. 616, Ga. Coastal Plain, 617, Ky. 479, Me. 333, Miss. 765, Mo. 185, N.J. 617, N.Mex. 48, Nebr. 759, S.C. 480, Tenn. 481, Wash. 185, Wyo. 481.
wheat, and hay in rotation, residual effects of limestone, Ky. 479.
whole, proteins, biological value, 530.
winter cover and green manure crops for, Ga.Coastal Plain 617.
winter grazing, returns from, Ga.Coastal Plain 666.
yellow, odor, compounds responsible for, identification, Iowa 6.
yield increase and profits from better varieties and fertilizers, Miss. 48.

Corn—Continued.
*yields—*
effect of kernel size and shape, Wis. 333.
effect of rainfall and evaporation, 159.
effect of shelterbelt, Wyo. 481.
of varietal leaders, N.Mex. 760.
residual effect of *Sericea* on, Tenn. 481.
segregation of genes affecting, 177.
suggestions for increasing, La. 187.
Corncrib pressures, Ohio 548.
*Cornell University, notes,* 288.
Cornstalks and straw, use in soil building, Mo. 159.
Cornstarch—
*oxidation,* Iowa 6.
production, laboratory control technics for, Iowa 6.
Correlation, mathematical theory, principles, 430.
*Corticium—*
*album* n.sp., on orange stem, 358.
*areolatum,* cause of citrus leaf spot, 80.
*fuciforme, notes.* U.S.D.A. 344.
*gelactinum* on apple trees, 80.
*solani,* use of name, U.S.D.A. 636.
*Corydalis caseana,* studies, Nev. 540.
*Corymbites aeripennis destructor,* control, relation to summer-fallow, N.Dak. 226.
*Corynebacterium—*
*equi,* serological classification, 251.
*infections in swine,* 112.
*ovis* infection, agglutination reaction in, 111.
taxonomic notes, 607.
*Coryneum—*
*beijerinckii,* notes, 356.
*berckmanii* n.sp., description, 647.
*cardinale* canker on cypress, 513.
*carpophilum n.comb., proposed name,* 646.
*Corythucha tuthilli,* undescribed, from Colorado, 797.
Coryza in chickens, vaccination for, Wyo. 541.
Cost of production, *see specific crops.*
*Cotinis nitida, see* June beetle, green.
Cotton—
*American-Egyptian, utilization, supplies,* and prices, Ariz. 260.
angular leaf spot infection, winter carryover in Arizona fields, 642.
*aphid, nicotine sulfate dust for control,* Miss. 798.
aphid on camellia, Ala. 519.
*Ascochyta* blight, outbreak, U.S.D.A. 783.
*black root rot caused by Thielaviopsis basicola,* 780, 781.
boll rots, micro-organisms associated with, 780, 781.
*breeding, Ark. 48, Ga.Coastal Plain 617,* N.Mex. 48, P.R.Col. 617, S.C. 480, Tenn. 481.
breeding, hormone treated cuttings and *special type grafts in,* 745.

Cotton—Continued.
crosses, hybrid vigor in, S.C. 480.
culture experiments, Ark. 48.
disease, new, in Azerbaidzhan (Azerbaijan) 784.
disease survey, S.C. 501.
diseases, extension work on, 780.
diseases virus, insect vectors, 784.
drying, sources of heat for, U.S.D.A. 831.
duck, bleached, changes produced in by cellulose-decomposing organisms, U.S.D.A. 428.
effect of fertilizer neutralized with dolomite limestone, Miss. 48.
effect of fertilizers on fiber quality and on fruiting parts, Ark. 48.
effect of girdling and topping on survival of *Phymatotrichum omnivorum* on roots, 780, 781.
effect of preceding corn interplanted with legumes, Ark. 48.
electrical properties, references to, U.S.D.A. 834.
fabrics, quality in, determined by research, 717.
fertilizer and nutrition studies, S.C. 480.
fertilizer experiments, Ark. 48, Miss. 479, N.Mex. 48.
fertilizer placement, Ga.Coastal Plain 617.
fertilizers, neutral v. acid, Miss. 48.
fiber, developing, studies, 456.
fiber development, relation to the other boll constituents, 456, 605.
fiber, measuring length and fineness, technic for, Tenn. 481.
fiber methylation with ethereal diazomethane, 35.
fibers, cellulose membranes in, lamellate structure, 605.
flea hopper, studies, U.S.D.A. 84.
flea hopper, variations in abundance due to variations in preferred host plants, 656.
formulas and carriers of N, P, and K, Ga.Coastal Plain 617.
*Fusarium* wilt—
inheritance, S.C. 480.
relation to meadow nematode, 780, 782.
resistance, breeding for, Tenn. 501.
genetic studies, S.C. 480.
ginning, cooperative, development, 839.
ginning equipment and practices, Tenn. 256.
gins, numbers operated by cooperative gin associations and bales ginned by each, N.Mex. 116.
grade and staple estimates, N.Mex. 48.
grade, staple length, and tenderability in United States, U.S.D.A. 693.
hybridization of American 26-chromosome and Asiatic 13-chromosome species, 472.
hybrids and new strains, *Fusarium* wilt resistance of, 780, 781.
Cotton—Continued.
inbreeding, effect on staple length and lint percentage, Ark. 187.
insect pests in Philippines, 519.
insects, miscellaneous, studies, S.C. 518.
insects, summer months draw attention to, Miss. 652.
irrigation, duty of water in, N.Mex. 114.
irrigation experiments, N.Mex. 48.
land, and people, problem of, 405.
leaf worm, studies, U.S.D.A. 84.
losses from plant diseases, U.S.D.A. 201.
maximum yields with four-ton manure application, Miss. 479.
nitrogen and potassium top dressings for, Ga.Coastal Plain 617.
pectic substance in, relation to fiber properties, 860.
picking machinery, U.S.D.A. 831.
plantations, trends in land use, labor organization, and mechanization on, Ark. 115.
plants, age, relation to susceptibility to field inoculations with *Phymatotrichum*, 781.
plants, nitrogen and carbohydrate metabolism, effect of boron, N.J. 597.
plants, physiological changes in, 784.
production, legume nitrogen for, Miss. 617.
production, value of cover crops, manure or their combination, S.C. 480.
quality of 1939–40 crop, Okla. 689.
questions and answers on adoption of net-weight trading and standards for tare, U.S.D.A. 693.
resistance to *Phymatotrichum omnivorum*, 780, 781.
root aphid, studies, U.S.D.A. 84.
root aphids, control, S.C. 519.
root knot, under irrigation, crop rotation v. fallowing for control, 780, 782.
root rot—
infection, effect of deep tillage on, 781.
infection of seedlings in greenhouse, 781.
on soil types, effectiveness of organic manures in control, 780, 781.
sclerotia, number and viability from areas cropped continuously to susceptible and nonsusceptible crops, 781.
serological studies, 76.
spots in Arizona, map history, 781.
rotation experiments under Everglades conditions, Fla. 616.
S × P, comparison with Pima, U.S.D.A. 484.
sea-island—
development of production, Ga. Coastal Plain 617.
fertilizer experiments, Fla. 616.
selected references, 834.
secondary nutrient elements for, Ga Coastal Plain 617.

Cotton—Continued.
seed, *see* Cottonseed.
seedbed, winter preparation most profitable, Miss. 48.
seedling diseases in 1940, and fungi associated with them, U.S.D.A. 636.
seedling diseases, seed treatment for, S.C. 501.
seedlings, diseased, fungi found on, 780.
seedlings in greenhouse, infection by *Phymatotrichum omnivorum*, 781.
severely injured by weeks of unseasonable rainfall, Miss. 740.
staple lengths, produced in South Carolina in 1928–38, percentage distribution, S.C. 551.
tillage studies on Red Bay sandy loam, U.S.D.A. 829.
varietal selection for wilt resistance and fiber quality, S.C. 501.
varieties for Missouri, Mo. 188.
varieties, improved, registration, 53.
varieties, nutritional studies, and measurement of fibers, Ark. 48.
variety tests, Ark. 48, Ga. 187, Ga. Coastal Plain 617, Miss. 48, 479, Mo. 185, N.Mex. 48, Okla. 188, S.C. 480.
wilt development in resistant and in susceptible varieties, relation to N–P–K ratio in fertilizers, 781.
wilt development, relation to potash treatments, 780, 781.
wilt fungi, biological strains, Ark. 68.
wilt organism, variation in pathogenicity and cultural characteristics, 504.
wilt plats, chemical and physical studies on soils from, 781.
wilt plats, regional, nematode population and species determination on soils from, 782.
wilt resistance of wilt-susceptible and wilt-resistant varieties, and mineral nutrition, S.C. 501.
wilt-resistant lines, variation in fiber characters, S.C. 480.
wilt-resistant varieties, breeding, Ark. 68.
wilt, rust, and drought injury greatly reduced by potash, 352.
wilt variety tests, S.C. 501.
winter cover and green manure crops for, Ga.Coastal Plain 617.
winter cover crops on, comparison, Tenn. 481.
yield increase and profits from better varieties and fertilizers, Miss. 48.
yields, effect of skips of different lengths, Ark. 48.
Cottonseed—
and cottonseed products, processing, Tenn. 436.
anthracnose spore load on, U.S.D.A. 68.
cake in ration for finishing beef calves, value, Miss. 805.
dusting, relation to control of *Rhizoctonia* infection of seedlings, 780, 781.
effect of methods of treating and planting, 781.
Cottonseed—Continued.
germination, relation to fertilizer placements, S.C. 480.
gravity graded, field results with, 779, 781.
hulls, hemicelluloses from, 585.
hulls, hydrolytic treatment, 153.
meal, alone v. mixtures of protein concentrates as supplements to silage for fattening steers, Tenn. 529.
meal, analyses, Ariz. 233.
meal and hulls v. corn and lespedeza hay for fattening steers, S.C. 529.
meal, effectiveness in preventing rickets-like nutritional disorder in cattle on pasture, Fla. 666.
meal for pregnant and lactating sows, Ark. 94.
meal, iron-treated, as partial source of protein for pigs, Ohio 529.
meal, nutritive value, 668.
meal v. alfalfa hay v. wheat bran as protein supplements to silage in winter rations for calves, 384.
meal v. distillers' corn dried grains and tankage as protein supplements for fattening steers, Ky. 528.
meal v. distillers' corn dried grains for pregnant and nursing beef cows, Ky. 528.
meal v. soybean oil meal as protein supplements for milking cows, Hawaii 528.
oil, gossypol in, 585.
quality from plants killed by cotton root rot, 781.
soaking in boric acid, effect, 334.
storage tests, 780, 781.
treatment, effectiveness, U.S.D.A. 500.
treatment, extension work on, 780, 781.
treatments, N.Mex. 48, Okla. 207, U.S.D.A. 207.
Cottonwood—
cuttings, rooting, growth-promoting substances for, Ark. 65.
plantations, establishing with seed and cuttings, Ark. 65.
seeds, viability, effect of storage conditions and other treatments, Ark. 65.
stands, thinning, Ark. 65.
Cottony-cushion scale predator, maintenance of supply, P.R.Col. 651.
Country, *see* Rural.
County government of rural New York, receipts and expenditures, [N.Y.]Cornell 692.
Cover crops—
variety tests, Fla. 616.
winter, culture experiments, Ga.Coastal Plain 617.
winter, residual effects on cotton and corn, Ark. 48.
winter, variety tests, Ga.Coastal Plain 617.
Cow—
double mating with bulls of two breeds, twins from, 756.
manure, nitrogen content, effect of lime, Vt. 593.
tester's manual, U.S.D.A. 239.

Cowpea curculio, studies, S.C. 518.
Cowpeas—
green and mature, carotene in, 130.
variety tests, Ark. 48, Fla. 616, Ga. Coastal Plain 617, N.Mex. 48.
vitamin A and vitamin $B_1$ in, 531.
Cows—*see also* Cattle *and* Heifers.
barley feeding v. sole roughage ration for, economy of, Wyo. 535.
beef, winter ration for, Ga.Coastal Plain 666.
dairy, length of gestation in, Mo. 238.
dairy, on different planes of feeding, milk and butterfat production by, U.S.D.A. 536.
dairy, sweetpotatoes in rations, Miss. 666.
deterioration of udder in absence of streptococci, 538.
effect of anterior pituitary extracts on milk volume and fat production, 100.
genital tract of, H-ion concentration of various fluids, 807.
Holstein, live weight and milk-energy yield in, 392.
iodized, blood iodine values for, 239.
Jersey, milk yield, effect of carotene consumption on, 675.
lactating, home-grown hay and silage v. alfalfa hay for, nutritive values, West. Wash. 238.
lactating, roughage as sole ration, Mo. 238.
milk production, *see* Milk production.
milking, all-roughage ration v. roughage and grain feeding for, Tenn. 535.
milking, comparison of winter pasture v. silage for, Tenn. 535.
ovulation in, time of, Wis. 42.
Red Scindi nonlactating, blood constituents of, quantitative data, 233.
shy breeders, production of oestrus and stimulation of ovulation in, Wis. 42.
thyroxine injections during declining stages of lactation, Mo. 182.
udders, *see* Udders.
Cozymase—
and factor V from nicotinic acid, synthesis by human erythrocyte, 858.
and nicotinamide in blood, 714.
Crab apples, new hardy for Northwest, S.Dak. 774.
Crab louse control, 524.
*Crambus caliginosellus*, *see* Corn root webworm.
Cranberries—
effect on calcium retention, 847.
fertilization, N.J. 628.
flower and fruit production, Mass. 771.
harvesting methods, 196, N.J. 628.
irrigation and frost control, Wash. 190.
Cranberry—
blossom blast, 357.
bogs, control of weeds and shrubs in, Mass. 759.
bogs, frost protection on, Mass. 828.
bogs, rebuilt, effect of weeding and sanding, N.J. 628.
Cranberry—Continued.
bogs, use of chemicals for killing weeds in, N.J. 628.
bogs, use of honeybees in, 379.
false blossom—
breeding for resistant varieties, 214, Mass. 771.
virus-induced, N.J. 635.
fruitworm on blueberries, N.J. 651.
fruitworm, studies, Mass. 796.
insects, injurious and beneficial, Mass. 796.
juice, properties and manufacture, Mass. 862.
leafhopper, N.J. 651.
leafhopper, spread of false blossom by, 214.
root grub, studies, Mass. 796.
rosebloom and fruit rot, spraying tests for, Mass. 783.
spittle insect, Mass. 796.
storage and byproducts research, Mass. 725.
storage, studies, Mass. 828.
weevil, studies, Mass. 796.
Crassulaceae, studies, 169.
Crawfish control, time to poison burrows for, Miss. 143.
Crazy ant, notes, Conn.[New Haven] 652.
Cream—
acidity, effect of salt on microflora, 102.
cooling and storing for butter manufacture on Oregon dairy farms, 391.
cost of transporting to Boston, Vt. 837.
for butter making, vacreation of, 391.
for manufacturing purposes, annatto as tracer in, and its detection, 538.
frozen, prevention of oxidized flavor in, 673.
hydrolysis of fat in, effect of lactic acid, 537.
keeping quality, effect of salt on, 673.
keeping quality, effect of temperature, 391.
pasteurization efficiency, determining, Wis. 101.
pasteurization, high-temperature, for butter making, 536.
quality from creameries in southern Michigan, Mich. 102.
removal of French weed flavor from, 102.
sales, seasonal variation in, Me. 405.
tests, materials read as fat, density at 140° F. 538.
viscosity of, increasing, 241.
Creameries, Minnesota, competitive problems among, 102.
Creamery accounting, cooperative, 695.
Creatine in animal tissues, glycocyamine and methionine as precursors, 667.
Cricket—
house, Conn.[New Haven] 652.
mole, studies, U.S.D.A. 84.
Mormon, nematode as important parasite, 797.

Cricket—Continued.
Mormon, studies, U.S.D.A. 84.
Puerto Rican mole, parasite of, methods of collecting and shipping, 525.
*Crioceris asparagi, see* Asparagus beetle.
Crop—
and livestock reporting, developments in *since 1920, 115.*
diseases of South, extension work on, 780.
insect pests in Hawaii, notes, Hawaii 517.
insects, control, chart for, 519.
reporting and forecasting, government entry into field of, 115.
reports, U.S.D.A. 122, 267, 556, 694.
residues, use for soil and moisture conservation, 29.
rotations, *see* Rotation of crops.
yields, effect of organic matter on, N.J. 592.
*Croplands, abandoned, restoring, Colo. 618.*
Crops—*see also* Forage crops *and specific kinds.*
acreages, yield per acre, and production, Ohio 688.
average monthly prices received by farmers for, Ohio 689.
chemical composition, Tenn. 436.
*composition, Iowa 22.*
effects of preceding crops, Fla., 616.
*interception of rainfall by, 590.*
irrigated, yields, factors affecting, Nebr. 760.
*management, relation to wind erosion and duststorm hazards, U.S.D.A. 165.*
minor, retail agencies selling, P.R.Col. 689.
organic composition, relation to growth and maturity, Fla. 592.
plantation, tropical and subtropical, vegetative propagation, 625.
*severely injured by weeks of unseasonable rainfall, Miss. 740.*
sodium chlorate injury, comparative susceptibility, U.S.D.A. 72.
variety tests, N.Dak. 49.
yield and composition, effect of type and treatment of soils, Fla. 592.
*Crossopeora* new species, 636.
Crotalaria—
culture experiments, Ga.Coastal Plain 617.
rotation experiments under Everglades conditions, Fla. 616.
*variety tests,* Ga.Coastal Plain 617.
*Croton monanthogynus* as bank cover, 168.
Crown gall—
bacteria, chemical attenuation, 346.
behavior and pathogenicity of causal bacteria, Wis. 344.
growth, effect of animal hormones and vitamins, 346.
relation to growth substances, 346.
studies, 70.
susceptibility of Cupressaceae species to, 81.
Crucifer—
clubroot, N.J. 635.
mosaic disease prevalent in China, 209.
Cryolite—
effect on soils and plant growth, S.C. 518.
injury of fruit, magnesium oxide as corrective for, Tenn. 519.
*place in fruit pest control, 218.*
*Cryptocephalus incertus,* studies, Mass. 796.
*Cryptodiaporthe* and related conidial forms, fungi associated with, 348.
*Cryptomycina pteridis,* life history, notes, 202.
*Cryptotermes brevis,* notes, P.R.Col. 651.
*Ctenocephalus canis, see* Dog flea.
*Ctenocephalus inaequalis,* notes, 525.
Cucumber—
beetle, striped, control, Fla. 650, Mass. 796.
beetle, western spotted, damage to pole beans, 84.
diseases, epidemiology and control, S.C. 501.
downy mildew—
control, 780, 781.
dusting for, Fla. 634.
resistance, breeding for, P.R.Col. 625.
resistant variety, Fla. 634.
varietal tests with, S.C. 501.
fermentations, effect of sugar addition to brines, 436.
*fermentations, yeasts in, 436.*
insects, control, derris dust for, Miss. 520.
mock, seeds, dormancy and germination, 316.
mosaic in New Zealand, 348.
pickle, fresh, bacteriological methods of examination, 436.
pickles, fermentation under southern conditions, 468.
root knot, N.J. 635.
seeds, rest period in, Ark. 57.
virus in lilies, 71.
virus 1, strains of, effects in lily and tulip, 71.
wilt in Virginia, U.S.D.A. 783.
Cucumbers—
breeding, Ark. 56, Miss. 490.
experimental work on, Miss. 490.
fertilization, Ill. 336.
frequency of bordeaux injury on, P.R.Col. 635.
*greenhouse, production, Mo. 190.*
inheritance in, 474.
manure experiments with, Ark. 626.
Midget, new bush variety, 58.
response to superphosphate, 57.
studies, P.R.Col. 625.
variety tests, S.C. 488.
vitamin C in, 715.
*waxing, effect on loss of weight following* harvest, S.C. 488.
yields under irrigation, Okla. 190.
Cucurbit—
diseases, control, Ohio 501.
downy mildew, epidemiology and control, 780.

Cucurbitaceae, virus diseases in, 784.
Cull caliper, construction and use, 632.
*Cunninghamella blakesleeana*, growth, effect of forms of nitrogen and phosphorus, 312.
Cupressaceae, susceptibility of species to crown gall, 81.
Curly top in Pacific Northwest, U.S.D.A. 201.
Currant, black, sirup, vitamin C in, photochemical decomposition, 715.
Currants—
  black, breeding, 59.
  culture, Mo. 631.
  new hardy for Northwest, S.Dak. 774.
  vitamin C in, 715.
Currents, Pacific Ocean, relation to climates of the coasts, 19.
Curtain fabrics, rayon glass and cotton, selection and care, Ohio 573.
*Curvularia lunata*, notes, Tex. 206.
Cuterebrine larvae, taxonomic characters, 244.
Cut-over lands of Wisconsin, 836.
Cutworm—
  Atlantic, studies, Mass. 796.
  injury, controlled by poisoned bait, Miss. 525.
  variegated, control by thorough turning under and delayed planting after winter crops, Miss. 223.
Cutworms—
  rearing for laboratory toxicological studies, 659.
  studies, U.S.D.A. 84.
Cyanide compounds used as insecticides, bibliography, U.S.D.A. 217.
Cyanosis in chickens and mice, induced by sulfanilamide, 824.
Cyclamen mite, N.J. 651.
*Cyclocephala immaculata*—
  life history, Ky. 800.
  studies, Ark. 84.
Cyclones, speed over North America, 306.
*Cylas formicarius*, *see* Sweetpotato weevil.
*Cylindrosporium*—
  *chrysanthemi* synonymy, 214.
  in Indo-China, new taxonomy, 596.
Cypress, chlorotic, 513.
Cypress, *Coryneum* canker, 500.
Cypress, Monterey and columnar Italian, threatened by spread of canker in California, 513.
*Cyrtopeltis varians*, ecology, Hawaii 517.
Cysteine, effect on gonadotrophins, 184.
*Cysticercus*—
  *fasciolaris*, rats infested with, and normal rats, tissue reactions against injected *Cystorcercus* material, 821.
  *pisiformis* parasite of cottontail rabbit, 791.
Cystine—
  a possible deficiency in ration of alfalfa hay for milk production, 675.
  and methionine for growth and lactation, 669.
  as dietary lactagogue, 667.
  in aqueous solution, decomposition, 587.
Cystoamylase (cytoamylase?) in potato, variation, 598.
Cytology, experimental, monograph, 606.
*Cytospora chrysosperma*, biology, 513.
Dacinae of China, key to genera, 224.
Dairy—
  breeds, fusion of two Swedish, results, 43.
  bull associations, cooperative, U.S.D.A. 238.
  cattle and dairy cows, *see* Cattle *and* Cows.
  equipment, cleaning problems, 817.
  equipment, sterilization by irradiation, N.J. 676.
  farm organizations in Barron Co., Wisconsin, forces causing changes in, U.S.D.A. 552.
  farm rotation, with sweet corn as cash crop, N.H. 760.
  farmers in east-central Minnesota, production responses, U.S.D.A. 836.
  farming, future, effects of scientific discovery, 391.
  farming, future of, effect of changing economic situation, 391.
  farms, receipts and labor income, Mass. 835.
  herd, feeding, Ill. 392.
  herd improvement association herds, causes for cow removals, Mich. 100.
  herd improvement associations, demonstration as means of developing, 391.
  industry—
    economic barriers affecting, 674.
    importance of selective registration to, 608.
    in United States, list of references, 834.
    of Minnesota, trends in, Minn. 117.
  plants, cooperative, suggestions for improvement, Wis. 117.
  plants, data, Wis. 117.
  production, in rapid increase during past years, Miss. 143.
  products—
    flavor in, factors affecting, 268.
    importance in diet of school children, 412.
    manufacture, factory sanitation in, 103.
    manufactured, production and consumption, U.S.D.A. 556.
    mold inhibitors on, effectiveness of propionates, 673.
    official flavor criticisms in National Contest, 539.
    plate count, effect of new standard milk agar, 392.
    quality, standard plate count as yardstick, 673.
    shipments into Knoxville, Tenn. 265.
    vitamin $B_1$ assays, 132.
  program, role of silage in, Miss. 528.
  sires, *see* Bulls *and* Sires.

Dairying—*see also* Creameries, Butter, Milk, *etc.*
in Mississippi agriculture, Miss. 535.
Dallis grass—
fertilizer experiments, Fla. 616.
*seeding methods on prepared pasture* land, S.C. 481.
yield and composition, relation to fertilizers, Fla. 49.
*Damping-off*—
control, Hawaii 501.
control for tree nurseries, improvement, Wis. 344.
*of seedlings, prevention*, 862.
Dams, sod hump, use, Wis. 306.
*Daphne cneorum* dieback, N.J. 635.
Dark adaptation of normal and of vitamin *A-deficient subject, effect of anoxemia on*, 850.
Darwinism and Mendelism, pro and con discussion, 324.
*Dasyneura mali, biology and control*, Mass. 796.
*Dasyscypha*—
*ciliata* n.sp., description, 215.
*pseudotsugae* n.sp., description, 215.
*Datana integerrima*, *see* Walnut caterpillar.
Date mites, American, specific identity, 228.
Date palm—
decline, 500.
responses to soil moisture in saline soil, 198.
Dates, handling and storing at home, U.S.D.A. 63.
Datura beetle, striped, studies, Hawaii 517.
Day length, *see* Photoperiodism.
Daylight under Alpine conditions, photoelectric measurements, 305.
Deer, California mule, host for nematode eye worms, 249.
Deficiency diseases—*see also* Diet deficiency *and specific diseases.*
papers on, 425.
Dehydrator, *see* Dryer.
Delaware Station, report, 143.
Delphinium—
crown rot investigation fellowship, report, 359.
disease, 359.
*Dendroctonus*—
*brevicomis*, *see* Pine beetle, western.
*frontalis*, *see* Pine beetle, southern.
*monticolae*, *see* Pine beetle, mountain.
*ponderosae*, *see* Black Hills beetle.
*Dendrouterina nycticoracis*, cysticercoid of, 363.
Department of Agriculture, *see* United States Department of Agriculture.
*Dermacentor*—
*andersoni*, anaplasmosis transmission by, 395.
*reticulatus* from cattle, in Manchoukuo, 678.
*variabilis*, *see* Dog tick, American.
Dermatitis—
cercarial, in Manitoba, 244.
Dermatitis—Continued.
*chick, relation of raw egg white injury* in rats to, Wis. 126.
Dermestid larvae in composition board, Conn. [New Haven] 652.
*Derris constituents, chemical investigations*, U.S.D.A. 84.
*Derris elliptica*—
experiments with selected plants of, 794.
*variations in toxicity of races*, 794.
*Derris* species, selection experiments with, 793.
Desert, northern salt, effect of unrestricted *grazing on plant associations* in western Utah, 483.
Desserts, frozen, corn sugar and sirups for, 672.
Dewberries—
breeding, N.J. 628, West.Wash. 190.
variety tests, West.Wash. 190.
Dextrose—
in preserving industry, 583.
v. sucrose as carbohydrate source for excised tomato roots, 321.
variable increments in ice cream, effect on properties, 672.
Diabetic patients—
manual for, 563.
under insulin therapy, avitaminosis in, 714.
*Diabrotica*—
*duodecimpunctata*, *see* Corn rootworm, southern.
*soror*, *see* Cucumber beetle, western spotted.
*trivittata*, *see* Cucumber beetle, western striped.
*Dialeurodes citri*, *see* Whitefly, citrus.
Diamondback moth—
insecticide tests for, Ohio 518.
studies, U.S.D.A. 84.
Dianil blue, effect on late pregnancy in rats, 758.
*Diaphania*—
*hyalinata*, *see* Melonworm.
*nitidalis*, *see* Pickleworm.
*Diaporthe*—
and related conidial forms, fungi associated with, 348.
*vaccinii*, ascigerous stage of *Phomopsis vaccinii*, development, 357.
Diarrhea, scorbutic, studies, 425.
*Diatraea saccharalis*, *see* Sugarcane borer.
*Dicheirinia* genus, new taxonomy for, 204.
Dichloroethyl ether—
as soil fumigant for woolly apple aphid, 221.
for wireworm control, 377.
Dichlorophenolindophenol, 2,6-, standardization, 731.
*Diorodiplosis guatemalensis* n.sp., description, 223.
Dictyosteliaceae, nomenclature, cultural bases for, 467.
*Didymosphaeria*, new taxonomy, 40.

Diet—*see also* Food *and* Nutrition.
changes, actual or recommended, effect on agricultural production, 703.
deficiency diseases—*see also specific diseases.*
mass prevention, 425.
of children, *see* Children.
of infants, *see* Infants.
planning for vitamin content, 130.
Dietaries, rural, in Europe, 272.
Dietary deficiency, myocardial lesions resulting from, 823.
Dietary standards 844.
Diethylstilboestrol v. oestrone in causing oestrus and inducing sexual receptivity in spayed animals, 45.
Dietitian's place in hospital research program, 412.
Diets, manual of, 127.
*Digitaria* new species, 597.
Dihydrotachysterol, effect on types of experimental rickets in rats, 571.
2-4-dinitro-6-cyclohexyl-phenol, a new insecticide, toxicity studies, 520.
*Diogmites discolor,* parasite of May beetle pupae, Ky. 800.
*Diphenylamine* as soil poison against subterranean termites, 523.
*Diplodia*—
forms resembling *D. frumenti,* comparison, Fla. 634.
*zeae* dry rot of corn, Iowa 68.
*zeae,* inoculating method in the field, Iowa 69.
*zeae,* seedling resistance in greenhouse, Iowa 69.
*Diprion polytomum, see* Spruce sawfly, European.
Direction finding at 1.67-meter waves, 446.
*Dirofilaria immitis,* natural infection of fleas with, 827.
Discomycetes—
mechanics of fertilization in certain species, 468.
studies, 468.
Disease—
and insect pests, report of committee on, 517.
problems, new, Nebr. 783.
Diseases—
deficiency, *see* Diet deficiency diseases *and specific diseases.*
of animals, *see* Animal diseases *and specific diseases.*
of plants, *see* Plant diseases *and specific host plants.*
osteodystrophic, production, relation to calcium and phosphorus deficiency, 425.
Dishwashers, mechanical, bacteriological tests, 143.
Distemper—
canine, and fox encephalitis, differentiation of viruses, 546.
of mink, immunological and histological studies, 252.
Distemper—Continued.
permanent immunization by vaccine alone, 541.
virus, changes in virulence on fur animal ranches, 252.
*Ditylenchus dipsaci*—
cause of onion bloat, 355, 649.
control, 346.
in narcissus plantings in western Oregon, 782.
Dog flea—
parasite of cottontail rabbit, 791.
potential vector of *Dirofilaria immitis,* 827.
Dog heartworm, natural infection of fleas with, 827.
Dog tick, American—
and brown, hereditary transmission of anaplasmosis by, 106.
control, N.J. 228.
distribution and host relations, Del. 85.
ecology in Southern Alberta, 364.
studies, U.S.D.A. 84.
Dog tick, brown, control, N.J. 228.
Dogfish liver, vitamin D potency, 717.
Dogs—
blood calcium and phosphorus in, variations with age, 669.
coach, inheritance of position preference in, 179.
experimental hookworm infection, immunological reaction, 821.
experimental matings of color-bred white bull terriers, 611.
factor II deficiency in, 385.
iron excretion by gastrointestinal tract ?, 414.
long-haired dachshunds, inherited jaw anomaly in, 179.
normal and blacktongue, V-factor content and oxygen consumption of tissues, 857.
normal and immune, antipneumococcal activities of macrophages and polymorphonuclear leucocytes in, 822.
nutrition, vitamin B complex factors in, 236.
production of riboflavin deficiency in, 531.
raccoon, toxoplasmosis in, 105.
running fits in, nutritive factors as preventive, Wis. 95.
vitamin A absorption by, 667.
vitamin A in livers of, 530.
vitamin B complex requirements, Wis. 95.
Dogwood crown rot, Mass. 783.
Dogwood lumber, use in lower South, 343.
Dolichopodidae of Utah, new and little-known, 799.
*Dolichopus vernaae* n.sp., description, 799.
Dorylaimoidea monograph, 82.
Dough—
colloidal behavior, 293.
development curves, variations in, 294.
development, relation to mixing speed, 294.

Dough—Continued.
effect of adding $\alpha$- and $\beta$-amylases to, 294.
effect of proteolytic enzymes added to, 582.
formation, starch as factor in, 442.
measuring fermentation rate and gas losses in, 441.
Doughnuts, preparation and frying at high altitudes, Wyo. 411.
Dove hybrids, partial sex reversal in, undescribed type, 332.
Doves, species differences in, genetic analysis, 182.
Drainage—
and irrigation research, Utah 548.
for Missouri soils, size, depth, and spacing of tile, Mo. 255.
Dried-fruit—
beetle, flight habits and seasonal abundance, 86.
insects, flight habits and seasonal abundance, 85.
*Drosophila*—
egg size relation to body size, 517.
speciation, levels of divergence in, 754.
Drought—
absolute, seasonal and geographical distribution in England, 159.
effect on white grub populations, 516.
injury to trees in Nebraska, U.S.D.A. 500.
*Drugs, chemotherapeutic, and synergistic action with anti-sera, testing*, 822.
Dryer, precipitate, description, 8.
*Duboscqia penetrans* n.sp., new species of sporozoan, life history and host specificity, 649.
Ducklings, fattening, scientific, 388.
Ducks—
Khaki-Campbell, rate and efficiency of egg production, N.J. 671.
mallard, production of eclipse plumage in, 611.
thyroid gland and plumage patterns in, relation, 610.
Dunes, coastal, factors and functions in, 32.
Dung insects, power of attraction and classified list, 517.
Dunghillcock, European, origin, 387.
Dusting, *see* Spraying *and specific crops*.
Dusts in potato insect control, 521.
Duty of water, *see* Irrigation.
Eagles, life and habits, 514.
Earth, rammed, walls, paints and plasters for, S.Dak. 589.
Earthworms, control in lawns and putting greens, Wis. 334.
Earwig, European—
in Utah, 83.
liberation of parasites of, Mass. 796.
*notes, Conn.[New Haven]* 652.
Easter lily seedlings, hybrid, forcing tests, Mass. 771.
*Echinocerous* n.spp., notes, 596.
*Economic life of France, decrees issued by* Government to control, U.S.D.A. 263.
Edema, generalized, in chicks, prevention by administration of *dl-$\alpha$*-tocopherol, 812.
Education—
agricultural *see* Agricultural education.
in transition in South Dakota, S.Dak. 696.
*researches in, at University of Minnesota*, Minn. 430.
Eelgrass wasting disease and re-establishment in Maine, U.S.D.A. 68.
Egg—
albumin, *see* Albumin, egg.
and poultry auction associations, cooperative, 695.
and poultry industries, mercantile exchanges in, 387.
and poultry situation in Canada, 386.
cooler, summer, home-made for farm use, Okla. 257.
export, centralization in Estonia, 386.
flavor, effect of feeding varying levels of fish meal, 98.
formation, partial ovarian ablation concurrent with, 389.
production—*see also* Hens, laying.
and mortality if layers in State egg-laying contests, changing trends, *N.J. 671*.
of turkeys, effect of all-night lighting on, Mo. 229.
performance, short-season, value as basis *for selecting layers*, N.J. 671.
rate and economy, effect of artificial lighting and heating, Wyo. 530.
rate and economy for pullets in insulated and uninsulated poultry houses, Ark. 94.
relation to time of hatching, Mo. 229.
proteins, biological value, 530.
solids, composition, 819.
solids, use in ice cream, Mass. 814.
weight, relation to its components, 387.
yolk—
color, effect of grass silage, 389.
hemoglobin synthesizing value of, Ky. 572.
lecithin and glycerine fractions, fat acids in, 587.
movements and hatchability, relation, Mo. 229.
quality and candling, 98.
ruptured, selective breeding as control, N.H. 805.
vitamin A accumulation in, 416.
Eggplant—
bacterial wilt resistant variety, 211.
little leaf, a transmissible disease, 211.
wilt, N.J. 635.
*Eggplants, studies*, P.R.Col. 625.
Eggs—
abnormal shape of, 182.
and poultry industry, economic services provided by government and private agencies, 387.

Eggs—Continued.
and poultry, international trade in, trends, 387.
cold storage, molds on, identification and prevention of growth, N.J. 237.
comparative fertility and hatchability, from hens in cages and on ground, Hawaii 528.
consumption habits in New York City, 387.
cooling in humidors, effect on quality during transcontinental shipment, West.Wash. 236.
creation of reserves in, purpose and technic, 387.
detection of fertility in, 99.
embryonal development, effect of storage, 386.
for broiler production, pullet v. hen, Ark. 94.
frozen, industry in United States, 387.
frozen whole, bacterial contamination and improved method of defrosting, 388.
Government graded, retailing in Ohio, 387.
hatchability—
deleterious effect of cottonseed oil, S.C. 529.
effect of interior quality, 386.
effect of riboflavin deficiency, Wis. 95.
effect of some protein supplements on, 386.
relation to nutritional factors, 386.
incubation, *see* Incubation.
infertile, value in chick rations, Wis. 382.
interior quality—
effect of heredity and environment, Wash. 229.
factors affecting, 388.
measurements, application to practical problems, 388.
Iowa, marketing methods and costs, 387.
keeping quality and production, factors affecting, Mo. 229.
laid by one hen, feed purchasing power, Mo. 229.
luminescence test for, 388.
marketing—
cooperative, economic analysis, 387.
cooperative, in Ohio, 557.
difficulties faced by cooperatives in Ohio 835.
in England and Wales, 386.
in Germany, regulation, 386.
off-flavored, analyses, Mass. 725.
price-quality relations, application of analysis of covariance, 834.
prices in England, 387.
produced per 100 hens, data, Ohio 689.
quality, effect of storage, Wash. 229.
short-time holding of, temperature and humidity in, 388.
Eggs—Continued.
size, physiological factors affecting, Ark. 94.
soiled shell, utilization, 388.
standardization and grading program in Ohio, 387.
storage conditions of, unit for measuring, 388.
storage of, changes in ovomucin during, 388.
storage shell, profits and losses on, 387.
washing, effect on hatchability, Mo. 229.
winter, hatchability, effect of manganese supplement and sunlight on, Wis. 95.
Eggshell—
permeability for bacteria, and their importance for cool storage, 388.
porosity, relation to hatchability, 534.
quality, inheritance, West.Wash. 236.
*Eimeria*—
sp., parasite of cottontail rabbit, 791.
spp. in chickens without gross lesions, 827.
*Elasmopalpus lignosellus*, pest of cereals in São Paulo, 369.
Electric—
brooding of chicks, Mo. 255.
facilities on farms, Me. 405.
fence controllers, operating costs, Mo. 255.
motors, small, adaptation to farm use, Nebr. 828.
Electricity, use in Washington agriculture, Wash. 256.
Electrocardiogram, bovine, studies, 807.
Electrodes, zeolitic membrane, use of, 8.
Electrodialyzer for work on starch, requirements, 150.
Electron bombardment of biological materials, 457.
Electrophoresis methods for isolation and characterization of biologically important substances, 455, 466.
Elements, minor—
effect on crops, 349.
in human and animal nutrition, 129.
relation to plant and animal nutrition, bibliography, 748.
relation to plant and animal nutrition, bibliography, botanical index to, 748.
requirements, spectrographic determinations of, Ky. 436.
Elevators—
cooperative farmers', data, Iowa 116.
farmer owned, financial operations, 407, Ill. 839.
Elk, range habits on Selway Game Preserve, 215.
Elm—
bark beetle—
native, effects of solar heat on subcortical development, Mass. 796.
smaller European, control, 662.
smaller European, notes, Conn.[New Haven] 652.

Elm—Continued.
bark beetles, feeding period, generations, and habits, 215.
*Cephalosporium* wilt in Massachusetts, Mass. 790.
disease, Dutch—
control, 215, 662.
detecting by trunk sampling, 512.
eradication, U.S.D.A. 68.
insect vectors, Mass. 796, U.S.D.A. 84.
*Scolytus sulcatus* as vector under controlled conditions, 377.
spread, factors affecting, 215.
studies, Mass. 783, Me. 344.
leaf beetle, parasites of, 801.
leaf beetle, rotenone-bearing insecticides for control, 376.
trees, virus phloem necrosis of, Ohio 501.
trees, young, importance of soil pore space to, N.Y.State 194.
*Verticillium* disease, control, Ohio 501.
*Verticillium* wilt, U.S.D.A. 782.
wood, stored, attempts to isolate *Ceratostomella ulmi* from, 81.
Elsinoe new species and variations in fructifications, 346.
Emmer, outstanding varieties, N.Dak. 49.
*Empoasca fabae, see* Potato leafhopper.
Encephalitis—
acute specific, infectious, of sheep, cattle, and goats, 545.
fox, and canine distemper, differentiation of viruses, 546.
human, caused by virus of equine encephalomyelitis, 819.
Japanese, comparison of concentrations of virus in blood, cerebrospinal fluid, and brain tissue of different subjects, 820.
St. Louis, susceptibility of wild mice to virus, 394.
Encephalomyelitis—
avian, Mass. 823.
avian, infectious, cultivation of virus, 400.
equine—
clinical manifestations, 516.
human encephalitis caused by virus, 819.
in avian hosts, 678.
in Iowa during 1939, studies, 541.
intradermal method of vaccination against, 541.
mosquito transmission of, 819.
pheasants surviving outbreak, neutralization tests with sera of, 819.
possible avian reservoir sources, 107.
relation to man and animals in California, 819.
studies, 677, 827, Nev. 540.
susceptibility of guinea pigs to virus inoculated through various routes, 244.
transmission, 819.
Encephalomyelitis—Continued.
equine—continued.
vaccination of man against virus, 251.
vaccine, reactions following administration, 680.
virus, eastern type, Mass. 823.
virus, immunological studies, 819.
virus, isolation and typing, 826.
virus protein, purification procedure, 399.
western type and botulism, differential diagnosis, 251.
infectious, of cattle, 396.
*Encopognathus*, new species from California, 804.
Endocrine—
imbalance induced experimentally, effects in female mice, 329.
literature of 1939, 616.
system and plumage types in fowls, 610.
Endocrines, histopathology in avitaminoses A and $B_1$ of rats, Ark. 127.
*Endophylloides* new species, 636.
Engineer, agricultural, and micro-climate, 740.
Enteritis—
necrotic, in pigs, relation to nutrition, Mich. 97.
syndrome in swine, 546.
Enterohepatitis, infectious, *see* Blackhead.
Entomological—
conditions in 1939, 519.
usage of subspecific names, 793.
Entomologists, Connecticut, program of annual conference Conn. [New Haven] 651.
Entomology—*see also* Insects.
at Dartmouth College, bequest for, 144.
Economic, American Association of, fifty years of work, 83.
laboratory guide in, 216.
Entozon, highly lethal to *Streptococcus agalactiae*, 679.
Enzymes—
adaptive production by bacteria, 607.
in milk, effect of added iodine and hydrogen peroxide to, 673.
*Ephestia figulilella, see* Raisin moth.
*Epicauta*—
*maculata, see* Blister beetle, spotted.
spp., control, S.Dak. 801.
*Epilachna varivestris, see* Bean beetle, Mexican.
Epinasty, production, by emanations from fruits and from *Penicillium digitatum*, 510.
*Epitrix*—
*cucumeris, see* Potato flea beetle.
*parvula, see* Tobacco flea beetle.
Ergosterol, production by *Penicillium carmino-violaceum*, 464.
*Eriococcus azaleae*, notes, Ala. 519.
*Eriopersicon*, n.subgen., notes, U.S.D.A., 753.
Eriophyid studies, new species, 528.
*Eriosoma lanigerum, see* Apple aphid, woolly.
Erosion, *see* Soil erosion.

*Erwinia tracheiphila* and *Phytomonas stewarti*, wilt induction by, comparison, 787.
Erysipelas in turkeys, West.Wash. 253.
*Erysipelothrix rhusiopathiae*—
  infection of peacock, followed by case of human erysipeloid, 107.
  isolation from swine, Ky. 540.
  phenol tolerance of, 249.
  studies, 683.
*Erysiphe cichoracearum* spp. on ornamental plants, 360.
*Erythroneura comes*, *see* Grape leafhopper.
*Erythronium*, karyotaxonomy of, 753.
*Escherichia coli*—
  indol production by, Mass. 843.
  *preparation of an active juice from*, 607.
  sensitivity to cold-shock during the logarithmic growth phase, 607.
Eskimos, basal metabolism, 127.
Ethyl mercury iodide as fungicide and nemacide, 205.
Ethylene production—
  by ripening McIntosh apples, quantitative study, 339.
  by ripening papaya fruit, Hawaii 488.
  during ripening of apple and banana, Minn. 339.
Eucharidae new species, descriptions, 804.
*Euchlaena-Zea* hybrids, inheritance of intergeneric differences in, 42.
*Euetheola rugiceps*, *see* Sugarcane beetle.
*Euhoplopsyllus*, new subgenera, erection, 525.
*Eulycopersicon* n.subgen., notes, U.S.D.A. 753.
*Euphasiopteryx australis*, parasite of Puerto Rican Changa, 83.
*Eupleotrus platyhypenae*, notes, 799.
*Euproctis terminalis*, biology and control, 222.
*Eurosta solidoginis*, autecology, 224.
*Euschistus variolarius* on tomatoes, control, 368.
*Euscirpus* subgenus, redefined, 169.
*Euspinolia*, systematic revision of genus, Minn. 379.
*Eutettix tenellus*, see Beet leafhopper.
Evaporation experiments, present trend in, 304.
Evergreens, hardiness, factors affecting, Mass. 771.
Evolutionary divergence, speciation as stage in, 754.
Ewes—*see also* Sheep.
  and lambs, barley as supplement to alfalfa for, Nev. 529.
  breeding, feeding experiments, Ky. 528.
  breeding, value of grain feeding for, Tenn. 529.
  periodicity of oestrus in, 183.
  range Rambouillet, selection. 178.
  sperm survival in different portions of vagina and uterus, Mo. 182.
  sterility in, treatment, Wis. 42.
  sway-back in, control by copper feeding, 234.
Exanthema, vesicular, of swine, 820.
Experiment station at Clarinda, Iowa, history, and description of watersheds, U.S.D.A. 590.
Experiment stations—*see also specific stations*.
  organization lists, U.S.D.A. 559.
  report, U.S.D.A. 862.
  report, 1939, editorial, 145.
Export-dumping plans, 834.
Exports, Mexican war emergency control of, U.S.D.A. 120.
Extension work, cooperative, in agriculture and home economics, U.S.D.A. 698.
Extraction apparatus, mechanically operated continuous, 438.
Eyes—
  dark adapted, method of measuring brightness threshold, 564.
  human, senescence of, and vitamin C deficiency, 138.
Fabrics—*see also* Textile(s).
  *flexibility and drape as measurable properties*, 860.
Factor—
  chick antidermatitis requirement of dogs, 236.
  filtrate, antidermatitis component of, in rats, 568.
  filtrate, deficient diet, activity of $\beta$-alanine in stimulating growth of rats on, 280.
  preventing nutritional achromotrichia, fractionation of, 382.
  II deficiency in dogs, 385.
  U and vitamin $B_6$, relation, 383.
  V and cozymase from nicotinic acid, synthesis by human erythrocyte, 858.
  V and nicotinic acid, relation in blood of pellagrins and normal persons, 420.
  W and pantothenic acid in nutrition of rat, 668.
  W, importance in nutrition of dogs, 236.
Fagaceae flower and fruit, ontogenetic and anatomical studies, 466.
Falcons, prairie, life and habits, 514.
Families—*see also Farm families*.
  industrial, farm, and part-time farm, in rural Mississippi, contrasts in levels of living, 286.
  migratory and stranded, development of economic opportunities in Montana for, 841.
  of clerical workers and wage earners, economic status, Mo. 861.
Family—
  income and expenditure, U.S.D.A. 286, 861.
  living, amounts and sources of income and distribution of expenditures, N.Dak. 267.
  living data, analysis, Mo. 286.
  living studies, international survey, 142.
Farm—
  accountancy statistics for 1936–37, 689.
  adjustments in Montana, area IV, Mont. 258.

Farm—Continued.
adjustments in Montana, subarea 33, of Area VII, U.S.D.A. 553.
animals, *see* Livestock *and* Animals.
buildings, for Southern States, plans, U.S.D.A. 834.
buildings plan service, N.J. 687.
bureau purchasing cooperatives in Indiana, 695.
business summary, Mich. 117.
buying distributed three ways, Miss. 688.
credit, *see* Agricultural credit.
disinfectants, efficiency, Wash. 242.
families—*see also* Families.
diet patterns, in Piedmont and Coastal Plains areas, S.C. 562.
socioeconomic status, construction and standardization of scale for measurement, Okla. 696.
freezing cabinets now available, N.Y. State 862.
home account books, analysis, Ark. 142.
income and production efficiency, relation, Utah 406.
income, cash, of Oklahoma, Okla. 405.
labor, *see* Agricultural labor.
laborers—
displaced, economic aspects of remedial measures, 697.
distribution and extent of unemployment in United States, 697.
our least privileged group, 409.
leases, types, including father-son agreements, Ill. 691.
loans, made by different types of lending agencies, Del. 116.
machinery, *see* Agricultural machinery.
management—
adjusting to changing economic situations, R.I. 406.
and costs on family-sized farms in sugarcane area, La. 259.
elements of, treatise, 559.
studies, Mo. 257.
survey, La. 260.
needs in the South, production in relation to, U.S.D.A. 693.
operating efficiency in Virginia, U.S.D.A. 690.
outlook for 1940, U.S.D.A. 117.
pests, control, 793.
planning, results of research in conservation for use in, U.S.D.A. 835.
population—
mobility, theory and consequences, Okla. 696.
nonfarm population, and number of farms in United States, U.S.D.A. 692.
of Oklahoma, changes in 1938, Okla. 406.
price statistics, revised, significance of, Okla. 406.
prices and price index of Nevada, 692.
prices, North Dakota, for February, 1940, N.Dak. 267.
Farm—Continued.
prices of North Dakota, N.Dak. 840.
prices since 1910 in Missouri, Mo. 266.
products, *see* Agricultural products.
profits in Area 3, west Tennessee, factors affecting, Tenn. 553.
real estate—
acquired by lending agencies, desirable resale policy, 405.
sale price, relation to assessed value, S.C. 551.
situation, U.S.D.A. 118.
taxes, delinquency in, S.C. 551.
receipts, expenses, and income, Me. 405.
receipts, expenses, income, etc., on sweetpotato starch farm compared with other farms, Miss. 688.
taxation, *see* Tax(es).
tenancy in—
Illinois, legal aspects, Ill. 554.
the State, Wash. 258.
United States, list of references, U.S.D.A. 554.
tenure, legislation affecting 406.
trucks, use in marketing farm products, Ind. 264.
units for Southern Great Plains, reorganization program, 405.
vehicles, rubber-tired, 256.
wages, data, Ohio 689.
woodland products, marketing, N.H. 265.
woodlands—
effect of grazing, 310.
role in soil conservation, Ohio 497.
*soil and climatic conditions in, effect of grazing,* 763.
youth, problems, 698.
Farmer—
families, independent, dietary habits, and condition of children, Hawaii 562.
planning for, short reading list, 834.
Farmers—
identification economically, 125.
purchases by, practices, economies available and utilized, and adjustments, N.H. 835.
Farming—*see also* Agriculture.
balanced, meaning of, Okla. 405.
contour, for soil and water conservation, Iowa 549.
dairy, *see* Dairy farm.
in inner bluegrass region, systems of, Ky. 551.
in outer bluegrass area, factors affecting receipts, profits, etc., Ky. 551.
in Tompkins County, economic study, [N.Y.]Cornell 690.
practical, for beginners, treatise, 559.
profits in type-of-farming area No. 5 of State, Ky. 551.
supervised, 405.
types and agricultural production in Minnesota, Minn. 689.
types and agricultural production, statistical supplement, Minn. 690.
types and ranching areas in New Mexico, N.Mex. 258.

Farms—
changes of acreages, acreages of different crops, and tillable and woodland pasture, Ark. 115.
dairy and cash crop, organization and management, Me. 694.
electricity on, *see* Electricity.
in central Arkansas, organization, management, and income, Ark. 115.
minimum sized, planning for Beadle County area, S.Dak. 835.
percentages classified as roughage and concentrate farms, and returns from, Mo. 257.
Wisconsin, human carrying capacity, Wis. 123.
*Fasciola gigantica* of cattle in Hawaii, control, Hawaii 825.
Fat—
and protein problem in German agricultural-chemical investigation, 603.
body, of different animal species, effects of diet oil, 381.
chicken and egg yolk, effect of starch on deposition and composition, 388.
in cream and in commercial butter, acid numbers, variations in, 393.
in diet, reducing need for vitamin $B_1$, Wis. 126.
materials expressed as, by volumetric tests of cream, density at 140° F. 538.
synthesis from protein by albino rat, 845.
Fats—*see also* Oils.
animal, 382.
animal and vegetable, nutritive properties, U.S.D.A. 269.
relation to utilization of lactose in milk, 272.
vitamin $B_1$-sparing action, 132.
Fatty acids—
of lecithin and glyceride fractions of egg yolk, 587.
saturated, effect on respiration of baker's yeast, 470.
spectroscopically active, deposition in liver, effect of adrenalectomy, 667.
unsaturated, and vitamin $B_6$, supplementary relations, 668.
Fauna of the soil, bibliography of, 516.
*Feather color in Barred Plymouth Rocks*, sexual dimorphism, 332.
Feathers, physiology of development—
diurnal curve of growth in Brown Leghorns, 331.
growth of mesodermal constituents and blood circulation in pulp, 331.
Federal—
Seed Act, relation to Montana farmers and dealers, Mont. 623.
service, personnel selection, training, and advancement in, new developments in, 404.
*Surplus Commodities* Corporation, programs and activities, U.S.D.A. 122.



Feeding experiments—*see also* Cows, Pigs, *etc.*
limited, new technic for, 382.
Feeding stuffs—
digestibility, quantitative indicator method for determining, 668.
digestibility, with rabbits, 388.
home-grown, for poultry, 386.
inspection and analyses, Ariz. 238, Mass. 233, Vt. 666.
most important animal protein, 386.
utilization by cattle, Pa. 807.
utilization by rabbits compared to wethers and pigs, 669.
Fences—
electric, operating cost of controllers, Mo. 255.
farm, popular discussion, U.S.D.A. 257.
Fenugreek meal, digestibility, Calif. 532.
Fermentation—
alcoholic, mechanism, 468.
and micro-organisms, textbook, 752.
Ferns—
diseases and pests, 648.
of Kansas, annotated list, Kans. 596.
of Saline County, Kansas, 168.
structure of chloroplast and location of chlorophyll in, 602.
Ferron and fluorine, colorimetric determination, 151.
Fertilizer—
control office, Arizona, report, Ariz. 744.
experiments—*see also special crops.*
on Coastal Plain soils, Ark. 22.
studies, cooperative, Tenn. 448.
Fertilizers—
acid-forming, injury from and need for neutral materials, Miss. 168.
analyses, N.J. 314.
and soils studied with Mitscherlich's pot tests, P.R.Col. 593.
and soils, studies, Ky. 455.
for New Jersey, grades and basic ratios, N.J. 31.
inspection and analyses, Mass. 168, N.H. 31, R.I. 594.
inspection, registration, and labeling, Mo. 745.
need for adequate amounts and quality, Miss. 168.
repeated application and nutrient availability, Ark. 22.
returns from investment on meadows left down for 2 or 3 yr., Ohio 480.
Fescue grasses, pink patch of, U.S.D.A. 344.
*Festuca octoflora hirtella*, new grass for Kansas, 168.
Fetuses, mammalian, susceptibility to viruses, 819.
Feulgen reaction in cytology, use of and effect of fixatives, 465.
Fever—
metabolism and vitamin C in blood, relation, 570.

Fever—Continued.
therapy, serum vitamin A picture in, 417.
Field borders, protecting, U.S.D.A. 30.
Fig leaves, parts of lamina missing from, U.S.D.A. 500.
Figs, varieties, Ga.Coastal Plain 625.
Filbert insects, studies, 795.
Filberts, variety tests, West.Wash. 190.
Fingergrass, woolly, improvement, Fla. 616.
*Fiorinia theae*, notes, Ala. 519.
Fir, Douglas—
needle-cast, associated with *Adelopus gaumanni*, 647.
new species of *Dasyscypha* on, 215.
seedlings, gall induced by *Bacterium pseudotsugae* on, 647.
Fire ant, studies, Hawaii 517.
Fire beetle, studies, Mass. 796.
*Fire blight in Nebraska, U.S.D.A. 500.*
Fires, forest, *see* Forest fires.
Fireworm—
black-headed, studies, Mass. 796.
control, Wash. 217.
hill, studies, Mass. 796.
Fish—
and fish products, vitamin D potency, 717.
liver oils of Australia, vitamin A and vitamin D in, 130.
meal v. roasted soybeans v. soybean oil meal as protein supplements for swine, Hawaii 528.
preparation, freezing, and storage, *N.Y.State 701.*
Fishery byproducts, value in poultry nutrition, 386.
Fishes, speciation of, 753.
Fixing solutions, two-part, double wash bottle for dispensing, 464.
Flavin—
adenine-dinucleotide in tissues of rats, reduction on diet deficient in flavin, 712.
deficient diet, effect on flavin-adenine-dinucleotide content of rat tissues, 712.
in pinto beans, effect of cooking, N.Mex. 126.
Flax—
*Botrytis cinerea* on, U.S.D.A. 500.
culture experiments, Wash. 185.
diseases in North Central States, U.S.D.A. 783.
germinating, time and temperature relations, 620.
outstanding varieties, N.Dak. 49.
rust, new physiologic races, 785.
seed, variety tests, Wash. 185, Wyo. 481.
Fleas—*see also special hosts.*
of eastern United States, 225.
Fleece-worm fly, response to stimulations of tarsal chemoreceptors, 224.
Fleece worm, studies, U.S.D.A. 84.
Flies—
house, *see* Housefly.
white, *see* Whitefly.
Flood—
forecasting in upper Mississippi Valley, 304.
of Connecticut River Valley, September 1938, 447.
Floods—
melting snow as factor in Sierra Nevada, 739.
of December 1937, in northern California, 402.
Floor finishes and cost reduction in rural housing, Ark. 113.
Flora—*see also* Plants *and* Vegetation.
of central Pennsylvania, 456.
of Crawford County State Park, Kansas, survey, 168.
of Kansas, new forms and nomenclature, 168.
of Patuxent Research Refuge, Maryland, 597.
Florida—
Station, notes, 431.
Station, report, 718.
University, notes, 431.
Flour—*see also* Bread.
Allis-Chalmers and micro-milling technics, comparison, 443.
baking properties, relation to starch in, 441.
beetle, red, in stored grain, fumigation with chloropicrin, 654.
characteristics, relation to particle size and starch cells of wheat, 443.
dough, absorption-mobility relations, 10.
moisture, determination in, rapid method, 442.
vitamin $B_1$ in, 417.
wheat, proteinase in, 441.
Flower—
color variation, genetics and chemistry of, 324.
crops, studies, Ohio 772.
seeds retailed in packets, quality, Mass. 771.
thrips, Florida, Fla. 650.
Flowers—*see also* Plants, flowering, *and* Plants, ornamental.
culture in gravel or cinders supplied with nutrient solutions, Ohio 488.
greenhouse, culture, subirrigation method in gravel and cinders, Ohio 777.
greenhouse, effect of steam sterilization of soil, Ohio 488.
growing in cloth houses, Ohio 488.
Fluke—
cecal, life cycle, Hawaii 518.
oviduct, in ring-necked pheasant, cause of curtailment of egg production, 515.
Fluorides, effect on salivary amylase, 427.
Fluorine—
contamination of commercial casein, effect on teeth of rats, 427.

Fluorine—Continued.
deficiency in rat diet, failure to establish, Ky. 436.
determination, method, Ky. 436.
determinations in rat and horse bones, Ky. 436.
effect on solubility of enamel and dentin, 572.
phosphate relations, Tenn. 448.
with ferron, colorimetric determination, 151.
Fluorosis distribution in India and in England, 706.
Fly sprays, studies, U.S.D.A. 84.
Fodder crops, *see* Forage crops.
*Fomes fomentarius* on birch, saprogenic nature, Me. 344.
Food—*see also* Diet.
canned, *see* Canned food.
consumption studies, S.C. 562.
control, British, U.S.D.A. 120.
control in Germany, U.S.D.A. 263.
Drug, and Cosmetic Act, new, Federal, features of interest to medical profession, 412.
Drug, and Cosmetic Act, new, Federal, public health aspects, 412.
habits and nutritional status of children in selected communities, Me. 410.
keeping fresh with special regard to use of cold, 701.
lockers, refrigerated, in Michigan, Mich. 126.
materials, American, proximate composition, U.S.D.A. 699.
mixer, electric, adaptation to different types of beaters, Nebr. 862.
movement in gastrointestinal tract, applicability of quantitative indicator method, 668.
needs of young adults, Ohio 562.
of Ceylon, analysis and mineral composition, 700.
of Dutch East Indies, nutritive value, 703.
of present-day Navajo Indians, 700.
production for use, bio-ecological and bioeconomic applications of, Me. 410.
riboflavin in, fluorometric method for determining, 151.
self-sufficiency of Japan, U.S.D.A. 555.
spoilage micro-organisms, action of acetic acid on, 346.
supplies, home production, Tenn. 561.
supply, world, bibliography, U.S.D.A. 555.
values at a glance, and planning a healthy diet, 844.
Foods—
baked, flavor and texture, effect of method of heat application and accompanying oven conditions, Me. 430.
Danish, vitamin A-active compounds in, 707.
flavor in, 268.
Foods—Continued.
freezing and storage in freezing cabinets and locker plants, N.Y.State 701.
fried at high altitudes, methods of preparing, Wyo. 411.
most important in different seasons, vitamin content, 707.
nicotinic acid in, Wis. 126.
per capita consumption by different income groups, P.R.Col. 689.
phosphorus in, total and phytic acid, 426.
quality control, redox potential indicators in, 301.
regional prices paid by Tennessee farmers for, Tenn. 553.
vitamins in, *see specific foods*.
Foot-and-mouth disease—
active immunization, 820.
of bovines, pseudo-gangrene complications in, 823.
virus, cultivation, 820.
Foot rot in cattle, Zephiran for treatment, 543.
Foot rot in sheep associated with anaerobes, 822.
Forage—
crops—
carotene and vitamin C in, 745.
carotene content during growing season, 814.
for pigs, rape *v.* sweetclover, Del. 94.
of Puerto Rico, nutritive values, P.R.Col. 805.
science and practice of conservation, 233.
variety tests, Ga.Coastal Plain 617, N.Mex. 48, Wash. 185.
weight, effect of potash, N.J. 592.
grasses, *see* Grasses.
nursery and plant adaptation studies, Fla. 616.
partition of less easily digested carbohydrate complex, 438.
plants, cell-wall constituents, development, 314.
plants in Puerto Rico, production and nutritive value, P.R.Col. 666.
plants of Oklahoma, carotene in, Okla. 668.
plants, seedings on burned-over land, West.Wash. 185.
poisoning—*see also* Livestock poisoning, *Plants, poisonous, and specific plants,*
due to saltpeter, Wyo. 541.
range, utilization, 381.
Forbs, seed propagation for conservation planting, U.S.D.A. 454.
Forest—
fire protection, Ohio 497.
fires, control, U.S.D.A. 343.
insects and small mammals, 790.
insects of Nanking and vicinity, 519.
insects of Sweden, 218.
land and agricultural land, differentiation, 449.

Forest—Continued.
nurseries, insect problem in, 516.
nurseries of the Carolinas, white grubs in, 216.
outings, U.S.D.A. 770.
pathology in North America, 81.
plantations, survival in northern Rocky Mountain region, 66.
plantings, coniferous, history of establishment, Pa. 779.
products, cooperative marketing, bibliography of, U.S.D.A. 407.
programs, State, planning, U.S.D.A. 497.
seedlings in nursery, fertilizer needs, Wis. 342.
seedlings, value of composted fertilizers for, Wis. 342.
site quality studies, in Adirondacks, [N.Y.]Cornell 497.
*soil profile, hardwood, reconstruction by* vegetative covers, 342.
soil studies, 25.
soils developed on young red (Patrician) drift, characteristics, 310.
*survey of Ohio*, 65.
trees, *see* Trees.
tropical rain, conduction of rainfall by plant stems in, 304.
vegetation, response to trenching, 200.
Forestry activities in the Carolinas, and Tennessee, 632.
Forests—
and construction of buildings, management, U.S.D.A. 497.
importance, care and use, U.S.D.A. 67.
new State, acquiring, Ohio 497.
products of and value from recreational angle, U.S.D.A. 67.
State, establishment, protection, and benefit of recreational activities, U.S.D.A. 497.
State, use as recreational areas, Ohio 497.
*Forficula auricularia*, *see* Earwig, European.
*Fossaria ollula*, notes, Hawaii 825.
Foulbrood—
American, breeding for resistance to, Wyo. 519.
*resistance to*, U.S.D.A. 84.
Fowl—
cholera immunity, duration following simultaneous injection of *Pasteurella avicida* and sulfanilamide, 400.
cholera, studies, 400.
paralysis, *see* Paralysis.
pox, control in day-old chicks, Hawaii 518.
pox immunity, experiments on, 819.
typhoid, studies, 547.
Fowls—*see also* Chickens, Hens, Poultry, *etc.*
blood indices, breed determined differences in, 609.
creeper, matings, identification of segregated phenotypes in progeny from, 182.
creeper, studies, 475.
Fowls—Continued.
crossing over and sex in, 44.
feminization of plumage, 610.
individual blood differences in, 181.
linkage map for six chromosomes, 609.
ptilopod, brachydactyly and syndactyly in, 610.
seasonal metabolic and endocrine rhythms in, Mo. 672.
sex-linked genes in, 181.
thyroid gland and plumage patterns in, relation, 610.
Foxes—
blue, vitamin $B_1$ deficiency in, blood picture and symptoms, 669.
increasing breeding and fertility by hormones, Wis. 42.
internal parasites, Wis. 105.
*Frankliniella*—
*cephalica bispinosa*, notes, Fla. 650.
*fusca*, *see* Tobacco thrips.
*moultoni*, seasonal history on hops, 85.
*vaccinii*, studies, Me. 364.
Freesias, culture, Mass. 771.
*Freezing by immersion, methods and media*, 153.
Frost—
damage, control in orchards with humidified heat, 628.
depth in forest and open in Connecticut, 633.
fruit studies in Florida, 740.
resistance, relation of K to, Wis. 342.
tabulated data, Ga.Coastal Plain 589.
warning and weather forecast service of Florida Station, Fla. 589.
Fruit—
breeding farm, Minnesota, report, 338.
bud development, factors affecting, 339.
bud formation, inducing, 194.
crop, new practices to regulate, Mo. 194.
diseases—
development of new sprays for, Ohio 501
in Idaho, U.S.D.A. 344.
in New York, U.S.D.A. 500.
in New York and Wisconsin, U.S.D.A. 635.
in 1937, 511.
in 1938, 645.
in 1939, 511.
in Ozark section of Arkansas, U.S.D.A. 68.
*not important in Arkansas*, U.S.D.A. 500.
notes, Fla. 635.
on New York market, U.S.D.A. 343.
drop, effect of very dilute α-napthaleneacetic spray, 776.
frost studies in Florida, 740.
growers of Massachusetts, new insect problems, 517.
growers of New York, insect problems, 516.
insect problems, 518.
insects, control, 367.

Fruit—Continued.
moth, oriental—
biological control, 658.
bionomics and control, Del. 85.
control by parasites, Ohio 518, U.S.D.A. 83.
effect of larval parasitization on infestation, 371.
effectiveness of parasites for control, 517.
in Japan and Chosen, 90.
in peach orchards, introduction of parasites, Mass. 796.
mass liberation of parasites, 371.
parasite project, 1939, 517.
parasites, Ky. 518.
situation, 515, 516.
studies, S.C. 518.
products, soft, utilization, Wash. 150.
season of 1939, climatic conditions, relation to production, 338.
set and size, effect of branch ringing, 59.
*set in Washington orchards, factors affecting*, Wash. 190.
tree buds, internal temperatures, 628.
tree diseases, virus, 346, 784.
trees, pollination, 194.
trees, pruning, Iowa 491.
trees, winter injury, relation to soil temperatures, Wash. 190.
Fruitflies—
of north China, 224.
of south China, 224.
Fruitfly—
infested products, treatments for entry into United States, U.S.D.A. 93.
Mexican, control, U.S.D.A. 84.
Queensland, toxicity tests, 799.
Fruits—*see also* Orchards, Apples, Peaches, *etc.*
breeding, 59.
canned, quality, reliability of retail prices as guides to, Ohio 116.
citrus, *see* Citrus.
culture experiments, Can. 336.
dried, spoilage due to sugar tolerant yeast, 346.
Florida, composition of ash, Fla. 581.
freezing preservation, research project, Utah 412.
frozen, commercial packs, microbiological studies, 154.
frozen, industry, N.Y.State 772.
frozen, use in ice cream, Utah 540.
grown in British Columbia, chemical constituents, 194.
Hawaiian-grown, vapor-heat treatment for, Hawaii 772.
Indian, cold storage, 494.
marketing regulation in South Africa, U.S.D.A. 120.
minor, Fla. 625.
mutant, produced by radiation, N.Y.State 193.
new hardy, for Northwest, S.Dak. 774.
nicotinic acid in, 713.
Fruits—Continued.
North Dakota grown, sharp freezing for cold storage lockers, N.Dak. 560.
of Florida, vitamin C content, Fla. 699.
of ornamental shrubs, vitamin C in, 715.
phenological investigations, N.Mex. 57.
pollination, Can. 336.
pome, morphology of flower, [N.Y.]Cornell 774.
preparation, freezing, and storage, N.Y. State 701.
production, climatic factors in, N.J. 628.
propagation, Can. 336.
responses from irrigation, Wash. 190.
ripening, hexose sugars in, Wash. 190.
ripening, pectic changes in, effect of ethylene, 61.
seedless, development by synthetic growth substances, 455.
selection of genetic strains high in minerals and vitamins, Me. 411.
small, virus diseases of, 784.
statistics, Calif. 267.
stone—
brown rot of, control, West.Wash. 202.
*Coryneum* disease in Argentina, 646.
gum-spot disease in South Africa, 356.
list of virus diseases, U.S.D.A. 201.
role of fixed copper sprays for, 356.
virus diseases of, U.S.D.A. 68.
storage and handling, Wash. 190.
studies, Ohio 772.
tests in toxic orchard soils, 628.
thinning, 492.
thinning an essential to quality and yield, Miss. 491.
utilization, Tenn. 436.
varieties, Fla. 624.
varieties, tree characters, Mass. 771.
variety tests, Ark. 56, Can. 336, Mass. 771, Tenn. 489, Wash. 190, West.Wash. 190, Wyo. 489.
vitamin $B_1$ assays, 132.
vitamins in, N.Y.State 848.
Fruitworm control, Wash. 217.
Fuchsin, basic, toxicity for bacteria, 456.
Fumigants—
for control of insect pests, U.S.D.A. 84.
greenhouse, naphthalene and similar compounds as, Mass. 796.
Fumigation—
of quarantined products, methyl bromide dispenser for use in, U.S.D.A. 83.
ship, chloropicrin as a prewarning gas in, 86.
studies, U.S.D.A. 84.
Fumigator, low-cost water seal, U.S.D.A. 83.
Fungi—
and plants, symbiosis, selective action in, 346.
causing decay in wind-thrown conifers, 361.

Fungi—Continued.
chytridiaceous, relation to disease in flowering plants, 346.
collected in southeastern United States, distribution, U.S.D.A. 783.
cytoplasmic structures in basidium revealed by silver impregnation, 745.
ecology, seasonal frequency in grassland, 603.
fleshy, of Crawford County, Kansas, 168.
found on diseased cotton seedlings from thirteen States, 782.
genetics of, problems, 466.
growth substance demand of, 468.
imperfecti, new taxonomic data, 456.
imperfecti, taxonomic monograph, 596.
in Hawaii, and hosts, check list, U.S.D.A. 345.
lower, biochemistry, 745.
mycorhiza-forming, effect on pine seedling growth, 463.
nutrition, 38.
of Florida, additions to list, 202.
outline and keys, 202.
phylogeny, significance of chitin and cellulose in, 468.
production of organic acids by, N.J. 593.
simple single-spore isolator for study, 785.
surviving exposure to radiation and high temperature, growth and other physiological characteristics, 468.
taxonomic problems in, 595.
thiamin-requiring, factors affecting yield, 468.
unusual chytridiaceous, 502.
variation of, 468.
wood-inhabiting, from region of Great Lakes, 512.
wood-rotting, biochemistry, 362.
yeastlike, anascosporus, taxonomy, 467.
yeastlike, dissociation, 467.
Fungicides—*see also* Sprays *and specific kinds.*
analyses, N.J. 193.
copper, *see* Copper.
design for laboratory assay, 784.
development and use, 72.
eradicant, 509.
use on ornamentals and shade trees, 360.
volatile, principles involved in their use, 72.
Fungus—
diseases in Hawaii, seasonal list, Hawaii 501.
flora of Nevada, U.S.D.A. 68.
growth rates, determination method, 779, 780.
spores, bombarded in vacuum with cathode ray beams, death rate of, 457.
spores, insects as disseminators of, 364.
Fur animals—
diseases of, Wis. 105.
nutritive requirements, Wis. 95.
reproduction in, application to breeding practices, 183.
Fur trade, glossary of terms used in, Iowa 215.
Furs, care and handling and traps and trappings, Iowa 215.
*Fusarium*—
*culmorum* inoculated into sterilized soil, survival, 27.
genus, biochemistry, 467.
in Indo-China, new taxonomy, 596.
*lycopersici*, notes, Mo. 201.
*moniliforme* on *Sansevieria*, 514.
*niveum* wilt of watermelons, control, Fla. 634.
*oxysporum*, cause of potato seed piece rot, 77.
*solani*, notes, 77.
species concept in, 203.
spp. on banana, 511.
strains from cotton and Burley tobacco, cross-inoculation experiments, S.C. 501.
*vasinfectum* isolates, pathogenicity tests, 780, 781.
*vasinfectum*, variation in pathogenicity and cultural characteristics, 504.
wilt, inheritance study of, 781.
wilt isolations from tomatoes, differences in growth characters and pathogenicity, U.S.D.A. 212.
wilt of potato, effect of dry land rotations on, Nebr. 783.
wilt resistance of cotton new strains and hybrids, 781.
yellows of celery, varietal susceptibility, Ohio, 75.
*Fusicladium dendriticum*, *see* Apple scab.
Galactose, *d*-, final solubility in water, 394.
Galacturonic acid, making from apple juice, Wash. 150.
*Galerucella xanthomelaena*, *see* Elm leaf beetle.
Gall midge, new species, predacious on mealybugs, 223.
Gall midges, economic aspects in West Indies, 224.
*Galleria mellonella*, *see* Wax moth.
Galls, casual complex of, role of dysauxony in, 346.
Game—
big, North American, review, 215.
mammals of Iowa, Iowa 215.
preparation, freezing, and storage, N.Y. State 701.
Gapeworms—
new intermediary vectors for, 401.
sex difference in infection rate of birds with, 401.
Garden—
beetle, Asiatic, damage in field of sweet corn, Conn.[New Haven] 652.
insects, studies, U.S.D.A. 84.
pests, control, 793.
*Gardenia*—
canker control, 359, 500.
diseases, control, N.J. 649.
leaf spot due to *Rhizoctonia*, 649.

Gardenias—
bud abscission, factors related to, Wash. 190.
effect of plant nutrients, soil reaction, and light, Mass. 771.
effects of soil temperature, Mass. 745.
Garlic rust in California, U.S.D.A. 782.
Gas gangrene anaerobes, toxin production by, 822.
Gases—
dissolved, in milk and dye reduction, Vt. 816.
in dense subsoils, method of sampling, advantages and limitations, 160.
Gastrointestinal motility, effect of nicotinic acid, 567.
*Gastrophilus nasalis*, *see* Botfly, throat.
*Gelasinospora*, nuclear migration in, 468.
Gelatin—
effect of aging treatments, Mass. 814.
protein, efficiency in forming serum albumin, 128.
stabilizing action, effect of drawing temperature and body and texture of ice cream, 673.
Genetics—
Congress, reports from, 176.
in the Soviet Union, present views, 324.
International Congress of, activities of sections, 176.
mammalian, 608.
Genus, concept of, papers on, 596.
*Geocoris decoratus*, notes, 363.
Georgia Coastal Plain Station, report, 718.
Georgia Station, notes, 431, 719.
Georgia University, notes, 431.
*Geotrichum* sp. from pink-stained southern yellow pine lumber, 513.
Geraniol samples used in Japanese beetle baits, properties, 374.
Geranium leaf crinkle, U.S.D.A. 201.
*Giardomyia rhododendri*, notes, N.J. 651.
Girls—
from birth to age of 5 years, progressive skeletal development, scale for rating, 275.
growth during adolescence, relation to change in basal metabolism, 270.
Gladiolus—
blight in Florida, role of *Botrytis* in, U.S.D.A. 782
*Botrytis* blight in Florida, epiphytotic of, U.S.D.A. 344.
bulb diseases, control, West.Wash. 202.
cormel germination experiments, 198.
corms, *Botrytis* dry rot of, U.S.D.A. 68.
culture in Iowa, Iowa 496.
seed production, effects of time of pollination and light intensity, 198.
thrips, Fla. 650.
thrips control, $\beta,\beta'$-dichloroethyl ether for, 368.
thrips control on corms during storage, U.S.D.A. 216.
thrips, control through winter and summer treatment, Minn. 368.
Gladiolus—Continued.
thrips, studies, U.S.D.A. 84.
thrips, field control, 655.
yellows disease, effect on germinating ability of corms, 359.
yellows problem solved by clean soil for clean corms, 648.
Glass-container research, Mass. 725.
Glaucoma-colpidium group of ciliates, antigenic properties, 821.
*Gloeosporium*—
*fructigenum* on peony, 359.
*musarum*, monographic study, 510.
spp. on ornamentals, N.J. 635.
*Glomerella glycines*, notes, 209.
Glutamic acid, *Dl-*, crystalline anhydrous and monohydrated, 297.
Glutamine, and growth of bacteria, 468.
Gluten—
protein fractionation from sodium salicylate solution, 581.
wheat, proteins, biological value, 530.
Glycerol—
fermentation, studies, 725.
neutral fat, in blood, determination with periodate, 301.
Glycine, effect on *Rhizobium*, 456.
Glycogen in liver of vitamin $B_1$-deficient rats, 712.
*Glypta rufiscutellaris* parasite or oriental fruit moth, 371.
*Gnomoniella*, new taxonomy, 40.
*Gnorimoschema lycopersicella*, *see* Tomato pinworm.
Goats—
dairy, improvement, N.Mex. 100.
external parasites of, U.S.D.A. 84.
Kirghiz, genetics of color and spotting in, 609.
parasites of, P.R.Col. 677.
poisoning by sacahuiste buds and blooms, Tex. 544.
Goldenrod gall fly, autecology, 224.
Golgi material in plant cells, 37.
Gonadotropic—
hormone, *see* Hormone.
substance, International Standard, graded doses, comparative action on infantile male and female rats, 479.
substances, comparative assay on rats, mice, and chicks, 612.
Gooseberries—
culture, Mo. 631.
vitamin C in, 715.
Goosegrass, seed germination, 764.
Gopher, pocket, control, Kans. 363.
*Gordius robustus* as parasite of Mormon cricket, 797.
*Gossypium* species, American tetraploid, origin, 755.
Gossypol, toxicity, for pigs and guinea pigs, Ohio 529.
*Gracilaria azaleella*, notes, Ala. 519.
Grain beetle—
flat, in stored grain, fumigation with chloropicrin, 654.

Grain beetle—Continued.
saw-toothed, development and survival, factors affecting, 802.
saw-toothed, flight habits and seasonal abundance, 86.
Grain borer, lesser, in stored grain, fumigation with chloropicrin, 654.
Grain—see also Cereals and Oats, Rye, Wheat, etc.
diseases, U.S.D.A. 500.
diseases in Wisconsin, U.S.D.A. 783.
farms, organization and crop production practices in Great Plains, U.S.D.A. 691.
foot rot in Pacific Northwest, U.S.D.A. 350.
foot rots and root rots in Oregon, Oreg. 74.
heap in the open, temperature, 517.
moth breeding rooms for parasite production, description, 658.
sacked, fumigation with chloropicrin, 653.
small, spring, changes in acreage, Nebr. 618.
smut, see Cereal smuts, Smut, and specific grains.
spring, response to fallow and other tillage practices, Nebr. 760.
sprouting, effect on nutritional value, 814.
stored, insects in, fumigation, U.S.D.A. 84.
stored, pests, control, Nebr. 519.
treated, effect of storage, N.Y.State 207.
weight, effect of potash, N.J. 592.
windrowing before combining, Wis. 114.
Grama grass, side-oats, disease of, 504
Gramineae of Douglas Lake region, Michigan, records for, 753.
Granary—
ever-normal, and insects, 516.
weevil, death-feints of, 227.
weevil in stored grain, fumigation with chloropicrin, 654.
Grape—
berry moth control, spraying for, Mich. 524.
berry moth, studies, U.S.D.A. 83.
boring plume moth, bionomics, 222.
cane girdler, biology and control, Mass. 796.
disease, resembling formerly prominent California vine disease, 500.
fruit rots, Fla. 634.
leafhopper, studies, U.S.D.A. 83.
plume moth, biology and control, Mass. 796.
plume moth in Boston area, 370.
Grapefruit—
pulp, dried, for milk production, 675.
refuse, dried, feeding value, Fla. 666.
Grapes—
Arkansas varieties, composition, Ark. 126.
causes of uneven ripening, Ark. 57.
Grapes—Continued.
Concord, chlorosis of, controlled by grafting, Utah 357.
Concord, nutrition, Mo. 189.
culture, in California, 630.
currant-type seedless, development, 777.
losses from plant diseases, U.S.D.A. 201.
muscadine, potash requirements, Miss. 198.
Ontario, and seedlings as parents, 495.
production in Texas, Tex. 776.
quality, spray schedules for, Miss. 193.
rootstocks for, Ark. 57.
self-pollinated vinifera varieties, progenies, 776.
studies, P.R.Col. 625.
training and pruning, Iowa 197.
varieties, Fla. 624, Ga.Coastal Plain 625.
varieties, evaluation in Northeast, 341.
varieties, new, promising, N.Y.State 198.
variety tests, N.Mex. 57, West.Wash. 190.
vinifera, on phylloxera-resistant rootstocks, testing, U.S.D.A. 62.
*Grapholitha*—
*molesta*, see Fruit moth, oriental.
*packardi*, see Cherry fruitworm.
Grass—
artificially dried v. naturally cured hay, Del. 95.
as remedy for small gullies, Wis. 306.
crops, Everglades, yield and composition, relation to fertilizers, Fla. 49.
diseases in Pullman nurseries, U.S.D.A. 68.
juice vitamin, nature and sources, Wis. 95.
methods for ensiling, Wis. 95.
mite, proposed name, 228.
mixtures and alfalfa in rotation for 2 years or longer, benefits, Ohio 480.
new for Kansas, 168.
seeds, germination experiments, Hawaii, 479.
sickness in horses, 399.
species, cytological studies, Ark. 48.
stripe smut, studies, 73.
Grasses—see also Lawns, Meadows, Pastures, etc.
adaptation studies, Hawaii, 479.
chemical analyses, P.R.Col. 806.
cytotaxonomic studies, 472.
durability of, studies, N.J. 617.
effect of burning on maintenance and establishment of improved types, Fla. 616.
ensiling with and without molasses, Fla. 616.
ensiling with phosphoric acid, losses from, 675.
erosion-controlling, Wash. 160.
forage, breeding, Wash. 185.
forage, comparative palatability, Hawaii 528.
forage, diseases, Wash. 202.
forage of east Texas timber country, composition, Tex. 232.
forage, tests, Nebr. 760.

Grasses—Continued.
forage, variety tests, Wyo. 481.
improvement, Fla. 616.
large, grown for silage, comparative production, Fla. 616.
new American, 597.
of Puerto Rico, nutritive values, P.R.Col. 805.
on typical sandhill range land, Nebr. 186.
pasture, breeding, Ga.Coastal Plain, 617.
pasture, variety tests, Ga.Coastal Plain 617, S.C. 480.
prairie, interception of rainfall by, 590.
processing seed of, U.S.D.A. 618.
range and browse, composition at varying stages of maturity, N.Mex. 95.
range, digestibility, 232.
range, growth behavior and relative composition as affected by burning, Fla. 616.
range, studies, N.Mex. 760.
response to intensity of clipping, Nebr. 760.
science and practice of conservation, 233.
snow molds of, caused by *Typhula* spp., 73.
suitable for silage, Mo. 806.
variety tests, Fla. 616, Tenn. 481, Wash. 185.
variously fertilized, forage production of, P.R.Col. 617.
western, water relations, 169.
Grasshopper—
baits no hazard to pheasants, Wis. 364.
control research, papers, 516.
eastern lubber, life history, food preferences, distribution, and control, Fla. 650.
egg pods, insect enemies attacking, S.Dak. 801.
parasites and natural enemies, new facts on biology, 515.
poison bait and turkey poult mortality, 685.
poisons, arsenical, effect on pheasants, 655.
variegated, notes, 219.
Grasshoppers—
control, Mo. 217, Nebr. 796.
control, poison bran bait recommended for, Miss. 523.
factor in soil erosion in Michigan, 654.
mid-western, identification of eggs, Kans. 367.
studies, Ark. 84, U.S.D.A. 84.
Grazing—*see also* Range.
all-season, experiment, Ohio 480.
crops for fattening feeder pigs, comparison, Fla. 666.
management, 381.
Green aphid, control, 218.
Green manure—
fertilizer experiment, S.C. 481.
v. sodium nitrate for small grains, N.J. 618.
Greenhouse—
studies, experimental designs to increase accuracy, 746.
thrips, notes, Ala. 519.
thrips, studies, U.S.D.A. 84.
Greenhouses, empty, equipment for burning sulfur in, Ohio 833.
Grocery buying habits in independent and chain stores, Wis. 142.
Growth, nuclear changes affecting, 324.
Growth substances, *see* Plant growth substances.
Grubs, white, *see* White grubs.
*Gryllus domesticus*, *see* Cricket, house.
Guamá leaf miner, P.R.Col. 651.
Guavas, studies, P.R.Col. 625.
*Guignardia*, new taxonomy, 40.
Guinea pigs—
coat color, study of genic effect on, 180.
hair and skin color in, physiological genetics, 180.
internal organ differences in, inheritance, 180.
lactation, role of hormones of adrenal cortex in, Mo. 182.
oestrous cycle of, 757.
pigment production in, 329.
reproductive system in male, postnatal development, and relation to testis hormone secretion, 478.
vaccination against *Brucella melitensis*, 822.
Gull, Franklin's—
feeding habits, N.Dak. 515.
fluke in, 363.
Gully control structures, behavior of models of, 403.
*Gymnosporangium juniperi-virginianae*, varietal susceptibility of apples to, 646.
Gypsy moth—
as it approaches the barrier zone, 218.
control, Conn.[New Haven] 651.
control and extermination, value to uninfested States, 657.
in Nanking, 519.
insecticides and spreaders for, 367.
notes, N.H. 796.
studies, Mass. 796, Me. 363, U.S.D.A. 84.
*Habrocytus cerealellae* in grain moth breeding rooms, combating, 658.
Haddock muscle, progressive decomposition, Mass. 735.
*Haemaphysalis leporis-palustris*, *see* Rabbit tick.
*Haemonchus contortus*—
efficacy of nonconditioned phenothiazine against, 543.
in sheep, anthelmintics for, 678.
resistance to various medicaments, 682.
Hailstorm of August 4, notes, Conn.[New Haven] 446.
Hair, anti-gray, vitamin, 667.
Hair pigmentation, loss of in rats, vitamin B complex factor concerned in, 567.
Hairy root, noninfectious, 355.

*Halisidota caryae*, *see* Tussock moth, Hickory.
*Hamadryas antiopa*, *see* Mourning-cloak butterfly.
*Hanseniella agilis*, embryology and affinities, 523.
*Haplostegus epimelas*, notes, 228.
*Haptoglossa heterospora* n.g. and n.sp., description, 649.
Hares, snowshoe, population cycle on Lake Alexander, 791.
Harlequin bug, studies, Hawaii 517.
*Harmolita*—
  *grandis*, *see* Wheat strawworm.
  *tritici*, *see* Wheat jointworm.
*Hassstilesia tricolor* parasite of cottontail rabbit, 791.
Hatchery industry, commercial, in United States, 387.
Hawaii Station, report, 574.
Hawks—
  in the hand, treatise, 514.
  sparrow, food habits in Utah, 652.
Hawthorn and cherry leaf miner, N.J. 651.
Hay—*see also specific kinds*.
  average yields per acre in Ohio, Ohio 257.
  better, from improved curing methods, Miss. 48.
  chopping for cattle, Wis. 382.
  corn and wheat in rotation, residual effects of limestone, Ky. 479.
  crop response in a 3-year fertilized rotation, N.H. 760.
  crops—
    annual, variety tests, N.Mex. 48.
    annual, yields of varietal leaders, N.Mex. 760.
    cultural and fertilizer practices on peat land, Wis. 333.
    of Upper Peninsula, improvement, Mich. 484.
    ripening, Miss. 759.
    silage from, 381.
    spring-sown, combination for, N.J. 617.
  dehydrated and sun-cured, Pa. 831.
  drying systems for small farms, 391.
  first-, second-, and third-cutting, comparative values for steers, Nev. 529
  moisture determination in, Ohio 535.
  naturally cured v. artificially dried grass, Del. 95.
  requirements on dairy farms, area in meadows for, Ohio 480.
  seeding mixtures, tests, Mass. 759.
  shed drying by forced draft, West.Wash. 186.
  stack curing with chimney ventilation, West.Wash. 186.
Hazelnuts, vitamins A and $B_1$ in, 707.
Health and climate, quantitative physical data useful in, 739.
Heat—*see also* Temperature.
Hegari in lamb fattening rations, amount of cottonseed meal necessary to supplement, N.Mex. 95.
Heifers—*see also* Cows.
  dairy, dried beet pulp v. sunflower silage as supplement to native hay for, Wyo. 535.
  dairy, factors responsible for delayed conception and sterility in, Ky. 535.
  dairy, growth rate on sole roughage ration, N.J. 676.
  dairy, urea as protein supplement replacement for, 382.
  effect of phosphorus and protein deficiency on ovulation, oestrous and reproduction, 675.
  growth rate on different rations, U.S.D.A. 676.
  twin-born with bulls, early recognition of freemartin condition in, 608.
*Helianthus* test, indicator of growth stimulation, 173.
*Heliothis*—
  *obsoleta*, *see* Bollworm, Corn earworm, *and* Tomato fruitworm.
  *virescens*, *see* Tobacco budworm.
*Heliothrips*—
  *fasciatus*, *see* Bean thrips.
  *haemorrhoidalis*, *see* Greenhouse thrips.
*Hellula undalis*, *see* Cabbage webworm.
Helminth parasites—
  and parasitic diseases of sheep in Canada, 248.
  in lambs on Scottish border farm, 397.
  of Australia, bibliography of, 395.
  of ducks, host-parasite catalogue, 401.
  of poultry, treatment and control, 254.
Helminthology—
  human, manual, 218.
  studies, 254.
*Helminthosporium sativum* inoculated into sterilized soil, survival, 27.
Hematologic standards in the aged, 847.
Hematology, historical aspects, 242.
Hematoxylin, Delafield's, for staining plant materials, 465.
*Hemerocampa pseudotsugata* and *Notolophus antiqua badia*, attempts to hybridize, 364.
*Hemerophila pariana*, *see* Apple and thorn skeletonizer.
Hemicelluloses extraction from plant materials, 10.
*Hemichionaspis aspidistrae*, *see* Fern scale.
Hemiptera affecting cotton, N.Mex. 85.
*Hemiteles biannulatus*, notes, 228.
Hemlock borer, studies, U.S.D.A. 84.
Hemocytoblastosis in chickens, 253.
Hemoglobin—
  building, importance of other factors than iron, Wis. 126.
  production, in anemia due to blood loss, effect of valine and isovaleric acid, 572.
  synthesizing value of egg yolk, Ky. 572.
Hemoglobinemia, parturient, of cows, relation to aphosphorosis, 110.

*Hemophilus* sp., role in hog pneumonia, 397.
Hemorrhagic—
- degeneration in young rats on low choline diet, 845.
- disease and lymphangitis in cattle, Nev. 540.
- septicemia, *see* Septicemia.

Hemp—
- manila, *see* Abaca.
- untreated and swollen, structure of phloem fibers, 170.

*Henous confertus*, control, S.Dak. 801.
Hens—
- breeding, value of milk products in rations, West.Wash. 236.
- laying—*see also* Egg production.
  - and chicks, protein requirements, Wash. 229.
  - antirachitic value of ultraviolet irradiation for, Nebr. 805.
  - effect of environment, Mo. 256.
  - individual studies, 387.
  - light requirements, Wash. 229.
  - methods of feeding grain to, Fla. 666.
  - potatoes and skim milk for, 386.
  - protein requirements, 386.
  - rations and feeding methods, Ohio 97.
  - silage feeding to, 386.
  - use of proteins from different sources, Nebr. 805.
  - vitamin A requirements, West.Wash. 236.
- saliva of, studies, 388.

Herbage, rough unpalatable, spraying with molasses and salt, 96.
Heredity—
- in cucumbers, 474.
- modern science of and application to animal breeding, 474.
- of black fibers in wool, Ark. 43.
- of guinea pig internal organ differences, 180.
- of quantitative characters in mice, 327.
- of sugar beet curly-top resistance, 354.
- of taillessness in mice, 180.

Herons, black-crowned night, effect of testosterone propionate on, 615.
Hessian fly—
- breeding for resistance to, U.S.D.A. 770.
- control, Mo. 217.
- inheritance of resistance to, 652.
- parasites, keys, U.S.D.A. 92.
- studies, Nebr. 796, U.S.D.A. 84.

*Heterakis gallinae*, phenothiazine for removal from chickens, 827.
Heteroauxin, toxic to yeast, leading to production of wound hormones, 172.
*Heterocampa guttivitta*, *see* Saddled prominent.
*Heterodera*—
- *marioni*, *see* Root knot nematode.
- *radicicola*, *see* Nematodes.
- *schachtii* on sugar beet, control, 362.

*Heteroderes laurentii*, *see* Wireworm, gulf.
Hexosamine in pineapple plants, distribution, 584.
Hexoses, biochemical formation of plant acids from, 467.
Hexuronic acid, *see* Ascorbic acid.
Hickory—
- and oak stands, defects reducing quality and yield, Iowa 66.
- bark beetle control, lead arsenate sprays for, Mich. 527.
- shuckworm on pecan, U.S.D.A. 83.

Highways, *see* Roads.
Hillcultural studies, Ohio 497.
*Histomonas meleagridis*, notes, 827.
*Histoplasma capsulatum*, dog as natural host and case history, 821.
Hodgkin's disease, status, 243.
Hog cholera, tests with crystal violet vaccine for prevention, Ohio 540.
Hogs, *see* Pigs *and* Swine.
Holly insects, control, West.Wash. 217.
Home—
- economics problems, statistical technics adapted to, 698.
- economics, research findings in, popularizing, 430.
- industries, marketing products of, Ark. 142.
- management, research methods, Mich. 429.
- tenure and rental payments, P.R.Col. 689.

Honey—
- and pollen plants of United States, U.S.D.A. 227.
- comb, in storage, larval pests in, 94.
- Florida, chemical composition and nutritive value, Fla. 699.
- heating, new equipment for, 379.
- increasing yields, Wis. 364.
- mineral constituents, ash, sodium, and potassium content, 411.
- plants, studies, U.S.D.A. 84.
- production, commercial, two-queen system, Wyo. 803.
- production, modified two-queen system for, Ohio 518.

Honeydew—
- melon anthracnose, control, S.C. 501.
- melons from different regions, variation in solids of juice, Calif. 337.

Hookworm infection in dogs, experimental, immunological reaction, 821.
Hop—
- aphid, seasonal history, 85.
- downy mildew, 500.
- downy mildew, in New York, U.S.D.A. 500.
- pests, field experiments, small plat system, 85.
- pests, seasonal history in Oregon, 85.
- powdery mildew control, N.Y.State 211.

*Hoplocampa fulvicornis* control, 527.
*Hoplopsyllus affinis*—
- notes, 525.
- parasite of cottontail rabbit, 791.

Hops, production, U.S.D.A. 491.
*Horcius nobilellus*, control, 368.

Hormiguilla in coffee groves, poison bait for control, P.R.Col. 651.
Hormone—
follicle stimulating, inhibition of action by pituitary, 45.
gonadotropic—
of pregnant-mare serum, purification, 328.
preparation from anterior pituitary sow, 328.
purified, effect of proteolytic enzymes, 45.
reducing variability of assays for, Wis. 42.
secretion, effect of oestriol, oestradiol, and progesterone in parabiotic rats, 330.
inhibitory, of the testes, studies, 330.
lactogenic, assay methods, 328.
male, effect on developing ovaries of chicks, 332.
*Hormones*—
animal, effect on growth of crown gall, 346.
*anterior pituitary, of sheep and cattle*, efficiency of extraction and separation, 44.
male and female sex, comparison of effects on immature female rats, 46.
mare gonadotropic, prolificacy of rats treated with, 477.
plant—*see* Plant growth substances.
sex, in *Achyla ambisexualis*, 318.
sex, prolonged administration to castrated rats, effect, 477.
sex, tolerance of male and female mice to, 758.
thyrotropic and gonadotropic, metabolism, 329.
wound, intercellular, produced by toxic effect of heteroauxin, 172.
wound, of *plants, structure and synthesis* of traumatin, 172.
Horn fly, studies, U.S.D.A. 84.
Hornworms, studies, 85.
Horse—
bot control, 516.
farm, United States Morgan, reproductive history of stud, 179.
semen, storage, 178.
sickness, *treatment with prontosil*, 542.
Horseradish—
diseases, control, N.J. 76.
root, regeneration, factors affecting, 315.
vapors, inhibitory properties, 151.
Horses—
breeding, handbook, 235.
blood picture, 250.
coat color in, genetics, 179.
draft geldings, nitrogen balance study, effect of limited feeding of oats and timothy hay during, 380.
draft, medium weight, breeding and development, 380.
energy expended during work, N.H. 805.
Horses—Continued.
English race, physiological variation in, relation to age, breed, and performance, 42, 43.
improvement by conformation standards, 380.
incoordination in, Ky. 540.
intestinal parasitism in Philippines, 251.
minimum lethal dose of selenium as sodium selenite, 543.
parasites of, P.R.Col. 677.
parasites of, life cycle, Hawaii 518.
removal of worms from, effectiveness of crude, unconditioned phenothiazine for, 399.
thoroughbreds, feeding and management, 380.
vitamin $B_1$ deficiency in, blood picture and symptoms, 669.
western, types and training, treatise, 236.
work, protein requirements at rest and at work, 670.
young, calcium, inorganic phosphorus, and magnesium in blood serum, 810.
Hospital research program, dietitian's place in, 412.
Hotbeds, electric, adaptability to farm use, Nebr. 828.
House—
cleaning management and methods, U.S.D.A. 287.
insulation containing animal material, control of pests in, Wis. 364.
over-crowding, prevalent in rural Utah communities, Utah 559.
Housefly—
hormone inducing pupation in, 525.
toxicities of smoke from derris and pyrethrum, 372.
vector of bovine mastitis, 679.
Household equipment studies, Me. 430, Nebr. 862.
Housing, urban and rural, 125.
Houston, D. F., necrology notes, 576.
Huisache girdler, notes, 662.
Humic acid, chemical nature of, 452.
Humus, alkaline raw, origin and properties, 310.
Hurricane damage, relation to insect work, 218.
*Hyalomma detritum albipictum* from cattle, in Manchoukuo, 678.
Hydrobiology, world's first symposium on, 144.
Hydrogen—
molecular, biological oxidation, 469.
*peroxide in colorimetric determination of* iron by thiocyanate, 436.
Hydrogen-ion activities, potentiometric method for measurements, 299.
Hydrologic studies, compilation, U.S.D.A. 21, 590.
Hydrophobia, *see* Rabies.
Hydroponics, *see* Plants, culture.
Hyenas, spotted, reproduction in, 182.

Hygrometer, improved electric, 18.
*Hylemyia*—
*antiqua*, *see* Onion maggot.
*brassicae*, *see* Cabbage maggot.
*cilicrura*, *see* Seed-corn maggot.
*trichodactyla*, role in dissemination of potato diseases, 77.
*Hylurgopinus rufipes*, *see* Elm bark beetle, native.
*Hymenia fascialis*, *see* Webworm, Hawaiian beet.
*Hymenocallis occidentalis*, seed of, 606.
*Hymenolepis*—
*carioca* of poultry, intermediate hosts, 255.
*diminuta* infections in rats, premunition and immunity in, 821.
genus, compendium, Okla. 650.
*Hyostrongylus rubidus*, experimental infection of swine with, 398.
*Hypera brunneipennis*—
discovery in Arizona, 93.
new to United States, U.S.D.A. 84.
notes, 664.
*Hypera postica*, *see* Alfalfa weevil.
Hypermagnesemia without clinical symptoms in dairy cattle, 239.
*Hyphantria cunea*, *see* Webworm, fall.
Hyphomycetes, predatory, destruction of larvae of nematode parasites by, 346.
*Hypoderma lineatum*, *see* Cattle grub.
Hypophyseal extract, effect on lactation in hypophysectomized post-gravid rats, 608.
Hypophysectomy of pigeons, technic, 332.
Ice box, new, for transporting live insect material, 658.
Ice cream—
coliform group in, 673.
consumer acceptance, effect of serving temperature, Mo. 238.
examination with Burri smear culture technic, 819.
home-made, bacteriological study, 394.
mixes, condensed, method for calculating Baumé reading, 394.
mixes containing sodium-phospho-alginate, viscosity, 673.
properties, relation to acidity and total solids in, 672.
quality, measuring, 242.
sampling method, 241.
sanitation, report of committee on, 818.
stability and meltdown properties, application of motion pictures in study, 673.
stabilizer, sodium alginate as, Mass. 814.
stabilizers, effect of aging treatments, Mass. 814.
sweetening agents for, 242.
texture, effect of addition of egg yolk solids, 819.
texture, effect of mix components, 105.
use of condensed skim milk in, Nebr. 814.
use of frozen fruits in, Utah 540.
Ice, melting, use of solar energy for, 739.
*Icerya purchasi*, *see* Cottony-cushion scale.
Ichneumon flies—
new genera and species with taxonomic notes, 804.
of subfamily Neorhacodinae, new genus and three new species, 804.
Icterus in a garbage-fed hog due to a foreign body, 546.
Idaho Station, notes, 144.
Idaho University, notes, 144.
*Illinoia pisi*, *see* Pea aphid.
Illinois Station, notes, 719.
Illinois University, notes, 719.
Immunity and natural resistance in plants, 346.
Incineration process and ash analysis, 726.
Income parity for agriculture, U.S.D.A. 692.
Incubating can for laboratory or field use, 362.
Incubation—
artificial, effect of temperature on time, 386.
trends of research in, 386.
Index numbers of production, price, and income, Ohio 116, 835.
Indiana Station, notes, 144, 431.
Indian-meal moth, flight habits and seasonal abundance, 85.
Indians—
Chippewa, basal metabolism, 127.
Maya Quiché, in Guatemala, basal metabolism, 128.
Indoleacetic acid—
and boron, interrelations in effects on plant growth, 172.
treatment of seeds and seedlings, effect, 318.
Industrial employment, part-time, as means toward better homes, Miss. 287.
Industry, trend of in the State, S.C. 551.
Infantile paralysis, *see* Poliomyelitis.
Infants—*see also* Children.
feeding with irradiated evaporated milk, 283.
iron metabolism in, 705.
normal and sick, vitamin K deficiency in, 285.
Influenza virus, epidemic, in mice, transmission by contact, 541.
Infusoria, ciliate, mating types and interactions in, symposium on, 753.
Inheritance, *see* Heredity.
Insect—
damage, evaluation under crop insurance plan, 652.
fauna of dung, ecological observations, 517.
flights, major cycle in, 523.
metabolism, relative effects of temperatures derived from constant and variable sources, 364.
outlook for 1940, in Nova Scotia, 522.
pests and disease, report of committee on, 517.
pests in Massachusetts orchards, 517.

Insect—Continued.
pests in Puerto Rico, control by epidemics of fungus disease, 83.
populations of Kansas, 217.
problem, aircraft, 793.
problems, effect of recent changes in agriculture, 652.
record, Conn.[New Haven] 651.
toxicology, three-dimensional graphs, presentation of time-dosage-mortality data by, 86.
vectors and virus, relations, 345.
work, relation to hurricane damage, 218.
Insecticide—
*dispersing agents, tests*, U.S.D.A. 794.
industrial, β-butoxy-β'-thiocyano-diethyl-ether as, experiments with, 793.
new, determination of public health hazard, 520.
*oils*, deodorized, 520.
Insecticides—*see also* Sprays *and specific forms*.
accessory materials for use with, U.S.D.A. 84.
analyses, N.J. 193.
and fungicides, direct, incorporation with protective, 793.
contact, penetration of, N.H. 796.
deposits on apples, effect of fruit growth and weather, 652.
inorganic, development, U.S.D.A. 84.
new, and spreaders on shade trees, 367.
new, determination of toxicity to goldfish, U.S.D.A. 84.
studies, N.J. 651.
synthetic organic, development, U.S.D.A. 84.
tests, Mass. 796, U.S.D.A. 84.
value in combating apple insects, N.Y. State 217.
Insects—*see also* Entomology.
*affecting man and animals*, U.S.D.A. 84.
and climate, N.J. 651.
*and ever-normal granary*, 516.
and insulation, 793.
as disseminators of fungus spores, 364.
associated with sweet corn, 804.
beneficial, introduction and propagation, *Fla*. 650.
biology, brood provision and rearing instincts, 522.
control, Can. 336.
economic, of Scotland, 797.
effect of selenium introduced into plant tissues on, 654.
forest, *see* Forest.
household and stored-product, U.S.D.A. 84.
household, evaluating liquid insecticides against, 520.
in coffee groves, P.R.Col. 651.
in their cocoons, method for study, U.S.D.A. 83.
injurious stages, identification key in Manitoba, 519.
injurious to crops, *see special crops*.
Insects—Continued.
interception at port of New York, plant inspections for, 363.
olfactory responses, 521.
orchard, *see* Orchard insects *and* Fruit insects.
oviposition, temperature coefficients for, 522.
physiology of, U.S.D.A. 84.
role in hybridization of lima beans, 489.
scale, *see* Scale insects.
soil, identification by burrow characteristics, 217.
soil-infesting, N.J. 651.
*test methods for recording moribund kill*, 793.
toxicity of nicotine administered internally to, 653.
undesirable aliens, 85.
wood-boring, *detection by X-rays*, 795.
Insemination, artificial—
conference on, 178.
cooperative, of dairy cows, lessons from 178.
electrical method of ejaculation in foxes for, Wis. 42.
methods, 184.
of dairy cattle, S.C. 535.
of dairy cows, efficiency, 178.
results from, Mich. 479.
Insulation—
fill-type, moisture accumulation in, relation to wall construction, Iowa 550.
not always what it seems, 793.
Intersexuality, experimental, 46, 477.
Intestinal protozoan parasitism, reciprocal effect of avitaminosis A and C, 425.
Iodine—
and peroxide number in milk, relation to oxidized flavor, 816.
content of Texas soils, 450.
feeding, increased, effect on a dairy herd, 239.
in animal nutrition, 669.
in city waters and vegetables in Texas, 275.
in iodized salt, stabilizing, Wis. 126.
in ration with reference to coli:acidophilus ratio in stools of rats, Mass. 843.
in soils, plant material, and waters, estimation, 300.
Iodine-starch complexes, absorption spectra, Iowa 6.
Ion equivalent, fundamental minimum lethal, 456.
Ions, surface migration and contact exchange, 6.
Iowa Station, report, 143.
Iron—
and manganese concretions in Dayton soils, 451.
availability in certain foods affected by freezing, Mass. 843.
availability in dried peas and beans, 274.

Iron—Continued.
determinations, colorimetric, use of hydrogen peroxide as oxidizing agent, 436.
effect on blood-forming organs of anemic animals, Hawaii 562.
excretion by gastrointestinal tract of dog, 414.
in human organs at various ages, 562.
in milk, effect of supplemental iron in dairy ration, Mass. 813.
in vegetables, Fla. 699.
metabolism in infancy, 705.
total and available, in vegetable foods, 704.
Irrigation—
and drainage research, Utah 548.
cost in 1939 of pumping water for, Nebr. 835.
costs, calculation, short cut in, Colo. 863.
experiments, *see special crops*.
practice, evaporation-index meter for use in, Ohio 20.
quantity of water used, time and methods, Wash. 256.
sprinkler, in humid sections of Oregon, 114.
system, small, Wis. 114.
water, duty of, N.Mex. 114.
water, saline, effect on soils, 26.
wells for, putting down and developing, U.S.D.A. 548.
*Iseropus*—
*bruneifrons septentrionalis* n.sp., description, 227.
*californiensis* n.sp., description, 227.
Nearctic species, 227.
Isovaleric acid, effect on hemoglobin production in anemia, 572.
Jacks—
enrollment in Indiana, Ind. 670.
feeding and care, Miss. 97.
sperm production, effects of feed on, 178.
Japanese beetle—
adult, control, tests of tergitol 7 penetrant for, 527.
and parasites, relation of ants to, 226.
as shade tree pest, control, 218.
control, U.S.D.A. 84.
control in Virginia, 226.
control, methyl bromide fumigation for, 526.
control, value of traps in, 374.
diseases of, N.J. 651.
feeding habits of adult, U.S.D.A. 660.
grubs, control in lawns and putting greens, Wis. 334.
insecticides and spreaders for, 367.
larvae populations, effect of introduction of milky diseases, 375.
larvae type A milky disease, survival under adverse conditions, 374.
larvae, vertical migration, 526.
milky disease, relation to control work, 801.
Japanese beetle—Continued.
studies, Conn.[New Haven] 651, Del. 85, Ky. 518.
traps, color, relation to effectiveness, 374.
traps, inexpensive, 373.
Jasminums, neglected, 168.
Jaundice, obstructive—
clinical use of 2-methyl-1,4-naphthoquinone in, 284.
prothrombin deficiency in, control by vitamin K, 424.
prolonged bleeding in, relation to prothrombin deficiency, 285.
Jellying, factors inducing, Del. 6.
Jerusalem-artichoke tubers, physiological studies, U.S.D.A. 458.
Jerusalem-artichokes, variety tests, Nebr. 759.
Johnson grass control, N.Mex. 49.
Juglandaceae flower and fruit, ontogenetic and anatomical studies, 466.
Jujubes, varieties, Ga.Coastal Plain 625.
*Juncus* n.spp., notes, 596.
June beetle, green, larvae in plant beds, Ky. 518.
June beetles, control research, 516.
Kale black rot—
chloropicrin as seed treatment for, 212.
notes, U.S.D.A. 68.
Kansas College, notes, 144.
Kelp, kelp ash, and synthetic salt mixture, comparative effects on cholesterol-induced atherosclerosis in rabbits, Mass. 843.
Kentucky bluegrass—
effect of temperature, calcium, and arsenous acid on seedlings, 458.
nutritive value, 381, 383.
response to soil temperature variations and moisture deficiency, Mo. 185.
Kentucky Station, notes, 431.
Kentucky Station, report, 574.
Kentucky Universtity, notes, 144, 431.
Ketene action on pituitary lactogenic hormone, 10.
Ketene generator, improved type, 10.
Ketosis—
in cows, anterior pituitary lobe hormones in treatment, 543.
relation to blood sugar and carbon dioxide combining power of plasma in, 675.
study, value of qualitative color test in, 675.
Kidney—
disease, diagnosis, relation to kidney physiology, 677.
stones, production on low-phosphorus diet, mechanism, Wis. 126.
Kidneys, human, iron, copper, and manganese in, 562.
Kitchen, institution, selection of fabricated equipment for, 430.
Knapweed, Russian, distribution and characteristics, N.Dak. 623.

Koa haole seed, effect of animal digestion upon germination, Hawaii 479.
*Kolla fasciata* reaction to lawn sprinkling, 652.
Kudzu—
for erosion control in Southeast, U.S.D.A. 188.
germination, improvement, Miss. 48.
*Kuehneola* new species, 636.
Labor, *see* Agricultural labor.
Lactation, hormonal inhibition, 614.
Lactic acid—
bacteria, additional factors required by, 460.
bacteria, growth, effect of riboflavin and of synthetic flavins, 101.
bacteria, growth substances of, 468.
bacterial cultures, thermophilic, adaptability to environmental conditions, 100.
fermentative production, use of agricultural products in, Iowa 6.
production, quick method, Wis. 6.
Lactoflavin—*see also* Riboflavin.
and thyroid gland, relation, 713.
Lactose—
acid hydrolysis and preparation of hydrolyzed sirup, 674.
in milk, methods for determining, Mo. 238.
in milk, utilization, relation to fats, 272.
in whey, commercial fermentation to lactic acid, 100.
Ladybeetle, new phytophagous, in Philippines, 526.
*Laemophloeus minutus*, *see* Grain beetle, flat.
Lambs—
and wool production, costs and returns from, Ky. 551.
creep-fed, comparison of rations for, Ky. 528.
early and late, comparative market value, Ark. 94.
early spring production, value of grain feeding to dams, Tenn. 529.
estimating weights at constant age, U.S.D.A. 235.
fattening, occurrence of apoplexy in, cause, Ohio 529.
fattening, rice products for, 532.
feeder, finishing and marketing, 381.
feeder, production and marketing, 381.
feeding experiments, Wyo. 530.
feeding experiments for study of urinary calculi, Colo. 808.
production associated with size and type in mutton sheep, 670.
profit on, effect of early weaning, Miss. 529.
quality, from types of western ewes, Ky. 528.
quality production, Iowa 96.
range, feeding, Kans. 384.
sorghum feed for, Nebr. 805.
soybean oil meal for, Pa. 809.
Lambs—Continued.
survival, growth, and selection, U.S.D.A. 234.
*Laminosioptes cysticola* in fowls, 400.
Lamps, fluorescent, as source of light for growing plants, 176.
Land—*see also* Farm land.
abandoned, revegetation of, Nebr. 741.
agricultural, resources, inventory and history of, Nev. 548.
class, social factors associated with, Tenn. 557.
classes, economic factors associated with, Tenn. 118.
classes, percentage used for different purposes, and size of business and net returns, Del. 116.
classification—
basic data for, Idaho 258.
bibliography of, U.S.D.A. 554.
in Alberta, relation to soil surveys, 449.
maps, Nev. 548.
credit, *see* Agricultural credit.
cut-over, *see* Cut-over lands.
economic theory, needed points of development and reorientation in, 404.
forest, *see* Forest.
grant college movement, evaluation of, editorial, 721.
grant college movement, notes, Mo. 862.
grant colleges, *see* Agricultural colleges.
logged-off, pasture studies, West.Wash. 185.
ownership and use in Grafton County, N.H. 835.
ownership in Oklahoma, Okla. 406.
ridding of objectionable growths and obstacles, Fla. 616.
settlement, committee of inquiry, report, 691.
tenure, Corn Belt conference on, 554.
tenure, West South Central conference on, 554.
use adustment, county planning for, 834.
use in Aroostook County, Me. 405.
use in selected areas of Ohio, 554.
use planning in Hawaii, 835.
use planning in Oklahoma, Okla. 689.
use planning under way, U.S.D.A. 835.
use, relation to land class in Jefferson Co., Tenn. 554.
uses in Worcester County, Mass. 835.
valuation, role of soil depletion in, 834.
value for grazing and dry farm wheat production, Wyo. 552.
Landscaping guide for Mississippi homes, Miss. 64.
*Laphygma*—
*exigua*, *see* Armyworm, beet.
*frugiperda*, *see* Armyworm, fall.
Larch, mycorhizal relations, 323.
*Larra americana*—
establishment in Puerto Rico, P.R.Col. 651.
methods of collecting and shipping, 525.

*Laspeyresia caryana*, *see* Hickory shuckworm.
*Latrodectus mactans*, *see* Spider, black widow.
Lawns—
and pastures, maintenance and white grubs, 516.
buffalo grass for, Nebr. 483.
management, R.I. 333.
soil moisture fluctuation under, 454.
sprinkling, reaction of leafhoppers to, 652.
studies, N.J. 617.
Lead—
arsenate—
and its spray residue, toxicity to sheep, 544.
brands, particle-size distribution, 86.
chemical effect of salts in soil and spray waters on, 520.
replacing by insecticides nonpoisonous to man, Wash. 217.
substitute spray material for, Mo. 659.
in very small amounts of biological materials, spectrochemical analysis for, 437.
poisonoing, effect of vitamin C on, 854.
Leaf roller—
on roses, control, 369.
red-banded, spraying for, 517.
Leaf samples in histological work, labor-saving technic for, 464.
Leaf xanthophylls, chemistry and functions, 601.
Leaf-footed bug, Fla. 650.
Leafhopper, blunt-nosed, studies, Mass. 796.
Leafhoppers—
reaction to lawn sprinkling, 652.
studies, U.S.D.A. 84.
Leaves—
grown under artificial light, internal surface, relation to chlorophyll concentration, 745.
of cereals, transpiration stream in veins of, 599.
resistance to movement of water in, factors determining, 747.
unilluminated, absorption of carbon dioxide by, 321.
Legume—
diseases, virus, in Ordzhonikidze region, 784.
hay yields, effect of superphosphate, Miss. 48.
inoculants, inspection, N.J. 189.
Legumes—*see also* Green manure *and* Alfalfa, Clover, *etc.*
adaptation studies, Hawaii 479.
African, proximate and mineral constituents of seeds, 700.
and nodule bacteria, noneffective associations of, 463.
available iron in, 704.
chromosome number due to infection by root nodule bacteria, Wis. 333.
ensiling with phosphoric aid, losses from, 675.
Legumes—Continued.
for cover crops and green manure, P.R.Col. 617.
in corn, interplanting, effects Ark. 760.
in wheat, early seeding of, Ohio 480.
inoculating in Florida soils, methods, Fla. 592.
inoculation—*see also* Nodule bacteria.
notes, Fla. 616.
interplanting with corn, effect on yields of succeeding crops, Ark. 48.
methods for ensiling, Wis. 95.
nicotinic acid in, 713.
of Puerto Rico, nutritive values, P.R.Col. 805.
on neglected hay lands, tests, N.H. 760.
pasture, studies, Fla. 616.
plowed under, effect on yields of cotton and corn, Miss. 759.
response to inoculation, Hawaii 479.
suitable for silage, Mo. 806.
summer, residual effects on cotton and corn, Ark. 48.
tests, Nebr. 760.
variety tests, Fla. 616.
*Leiopus nebulosus*, *Xorides indicatorius* as parasite, 379.
*Lema nigrovittata*, studies, Hawaii 517.
Lemna fly and parasites, 525.
*Lemnaphila scotlandae* and its parasites, obligate resident of duckweed, 525.
Lemon *Diplodia* stem-end rot, control, 358.
Lemons in storage, physiological studies, 63.
*Lentinus lepideus*, metabolic products, 362.
Lepidoptera—
affecting cotton in Brazil, 372.
food plants of larvae, 364.
suborder Rhopalocera, list, in New Jersey, 222.
*Lepidosaphes*—
*beckii*, *see* Purple scale.
*camelliae*, notes, Ala. 519.
Leprosy of rats, complement fixation in, 678.
*Leptinotarsa decemlineata*, *see* Potato beetle, Colorado.
*Leptocera digitata*, life history, 525.
*Leptoglossus phyllopus*, *see* Leaf-footed bug.
Leptospirosis in British Isles, 822.
Leptospirosis in Norway, 822.
*Leptothrips mali*, most common, predaceous thrips in North America, 655.
Lespedeza—
as forage in brown loam area, Miss. 185.
bacterial wilt, U.S.D.A. 76.
culture experiments, Ga.Coastal Plain 617, Tenn. 481.
hay for wintering beef cows and yearling heifers, Miss. 528.
hay v. alfalfa hay for bred ewes, Ky. 528.
Korean, selection and improvement, Del. 48.
Korean, undescribed disease of, Mo. 201.
pasture value, effect of stage of maturity, Tenn. 529.
powdery mildew, 641.
seed-harvesting equipment, Tenn. 403.

Lespedeza—Continued.
variety tests, Fla. 616, Ga.Coastal Plain 617, Tenn. 481.
*Lespedeza*—
*sericea* hay, availability of phosphorus in, Tenn. 530.
*striata* as bank cover, 168.
Lettuce—
diseases, N.J. 635.
grown in jars of sand supplied with cultural solutions, nutrition of, 627.
handling and shipping in New York [N.Y.]Cornell 772.
head, culture, N.Mex. 57.
improvement, Mass. 771.
marketing, U.S.D.A. 121.
May King, phosphate deficiency and yield tests on sand cultures, 490.
mildew, inheritance of immunity from, 355.
seed, Imperial 152, germination and seedling vigor, 490.
spotted wilt, control, 500.
studies, P.R.Col. 625.
vitamin C in, 715.
*Leucaena glauca*, notes, Hawaii 479.
*Leucinodes elegantalis*, parasite of, 379.
*Leucoptera*—
*caffeina* n.sp., description, 222.
*coffeela*, notes, P.R.Col. 651.
*daricella*, distribution, 222.
Leucosis—
and sarcoma, viruses and related substances producing, characteristics, 820.
fowl, studies, 253, Mo. 242, West.Wash. 253.
Leukemia—
and allied conditions in animals, etiology, Fla. 677.
and leukemic conditions of fowls resulting from application of tars or cancerigenic carbons, 820.
and sarcoma of fowls, chemical aspects of agents, 820.
studies, 243.
Library service, rural, U.S.D.A. 125.
Lice, sucking, treatise, 524.
Lichen symbiosis, nature of 468.
Light—
diffused, polarization, atmospheric radiation, and probable indications of weather changes, 18.
sense, clinical testing, instruments and technics for, 710.
*Lilacs, hybrid, propagation, Mass.* 771.
Lilies, cucumber and tulip viruses in, 71.
*Lilium* spp., regeneration in scale leaf of, 171.
*Lilium tigrinum*, cytological studies, 315.
Lily mosaic, of Easter lilies in Ceylon, 648.
Lima beans, *see* Beans, lima.
Lime—*see also* Calcium *and* Liming.
analyses, N.J. 314.
conservation studies, Tenn. 448.
effect on alfalfa and mixed seedings, Ohio 480.
Lime—Continued.
injury, cause and nature, Vt. 744.
magnesian and nonmagnesian forms, *comparison*, N.J. 592.
potash experiments, Tenn. 448.
products, inspection and analyses, Mass. 168.
soils, high, character, fertilization, and management, Iowa 22.
Lime (fruit)—
tree bark disease, Tahiti, Fla. 634.
Limestone—
dolomitic, decomposition in fertilizers, 594.
grinding, fineness of, Mo. 159.
residual effect, Ky. 455.
residual effects on yields of corn, wheat, and hay in rotation, Ky. 479.
returns from investment on meadows left down for 2 or 3 yr., Ohio 480.
Lime-sulfur, dry and liquid, comparison, Wash. 217.
Liming—
of soils, U.S.D.A. 455.
response of soils to, Mo. 159.
*Limnephilus indivisus* and its hymenopterous parasite, rearing, 228.
*Limonius*—
*californicus*, *see* Sugar beet wireworm.
*canus*, *see* Wireworm, Pacific coast.
*ectypus*, *see* Wireworm, eastern field.
Linkage studies in corn, 325.
Lipids in blood plasma of White Leghorn cockerels, interrelation, 236.
*Lipocystis* n.g. and n.spp. and new combinations, 204.
*Lippia cardiostegia*, new *Cercospora* on, 202.
*Listerella*—
encephalitis of sheep, cattle, and goats, 545.
genus, name *Listeria* proposed as substitute, 541.
infection in swine, 250.
*monocytogenes*, importance in human and in veterinary medicine, 685.
Listerellosis of sheep, Ky. 540.
*Listeria*, proposed as substitute for preoccupied name *Listerella*, 541.
*Listroderes obliquus*, *see* Vegetable weevil.
Litchi, asexual propagation, Hawaii 488.
Liver—
beef, protein, efficiency in forming serum albumin, 128.
extracts, filtrate fraction, rat growth factors of, 848.
fluke of cattle in Hawaii, control, Hawaii 825.
meal proteins, biological value, 530.
of chick, vitamin A accumulation in, 416.
of newly hatched chick, lipid content and changes during first month of life, 390.
protection, by thyroid during vitamin $B_1$ treatment, Wis. 126.

Livers—
fatty, as a result of thiamin administration in vitamin $B_1$ deficiency, 132.
fatty, in young rats, production on choline-deficient diet, 845.
human, iron, copper, and manganese in, 562.
Livestock—*see also* Animals, Mammals, Cattle, Sheep, *etc.*
auction sales in United States, 839.
average monthly prices received by farmers for, Ohio 689.
breeding, present knowledge, 178.
breeding, rate of progress, genetic principles governing, 178.
cooperative marketing at Cincinnati, 839.
diseases, *see* Animal diseases *and specific kinds.*
experiments with, Wash. 229.
farms in upper Ozark region, Ark. 115.
marketing, transportation cost in, Ohio 551.
numbers of different kinds, Ohio 689.
poisoning—*see also* Plants, poisonous, *and specific plants.*
by lead and coal-tar pitch, 397.
by lead arsenate on foliage beneath sprayed apple trees, 248.
registry associations, suggested improvements, 178.
statistics, *see* Agricultural statistics.
Living—
beings, development, mechanical equations expressing, and biophysical-chemical relations, 468.
material, spiral systems in organization, 315.
standards of, *see* Standards.
Loans, delinquent, best methods of servicing and handling, 405.
Locoweed, poisonous to livestock, Wyo. 541.
Locust, black (tree)—
clones, propagation by hardwood cuttings, 498.
damaged by fire, restoration, Miss. 67.
effect of top pruning on survival and early growth, 67.
growth of seedlings, relation to subsoil acidity and fertility, 342.
lightning injury to seedlings, 81.
Locust borer, control by silvicultural methods, Ark. 64.
Louping-ill, studies, 820.
*Ludius aereipennis, see* Wireworm, prairie grain.
Lumber—*see also* Timber *and* Wood.
and other products, production, U.S.D.A. 497.
Lungs in lethal mutation in rats, pathology, 181.
Lungworm as intermediate host of swine influenza virus, 821.
Lupines—
sweet, artificially dried, feeding value, 671.
variety tests, P.R.Col. 617.
*Lycopersicon* genus, revision, U.S.D.A. 753.
*Lycophotia margaritosa saucia, see* Cutworm, variegated.
Lyctus beetle attack, relation to depletion of starch from timber, 527.
*Lygocerus*, sp., parasite of Comstock's mealybug, 657.
*Lygus*—
*elisus* in alfalfa seed fields, control, Utah 523.
*hesperus* in alfalfa seed fields, control, Utah 523.
Lymphadenosis in a cow, account, 247.
Lymphangitis in cattle and hemorrhagic disease, Nev. 540.
Lymphoblastoma in bovines, 542.
Lymphomatosis, avian—
and allied diseases, symposium, 253.
and heredity, 44.
Lysimeter—
installation for studying forest influence problems, 342.
types, classification, construction, and performance, U.S.D.A. 741.
Lysimeters, drainage in, effect of different cropping treatments, Ky. 455.
Macadamia—
nut, development of oil in, Hawaii 488.
trees, chlorotic and nonchlorotic, foliar diagnosis, Hawaii 500.
varietal and cultural tests, Hawaii 488.
Machinery, *see* Agricultural machinery.
Mackerel—
flesh, vitamin D potency, 717.
liver, vitamin D potency, 717.
*Macrobasis*—
spp., control, S.Dak. 801.
*unicolor, see* Blister beetle, ash-gray.
*Macrocentrus ancylivorus*—
notes, 658.
parasite of oriental fruit moth, 371, Ohio 518.
*Macrodactylus subspinosus, see* Rose chafer.
*Macrosiphum* spp., biology, 798.
*Macrosporium*, pathogenicity and taxonomy, Fla. 634.
Mad itch, *see* Paralysis, infectious bulbar.
Magnesium—
deficiency of apple trees in sand culture and in commercial orchards, 508.
fate after intravenous administration to adults, 414.
in blood of young colts, 810.
in soils, quantitative determination, 300.
in very small amounts of biological materials, spectrochemical analysis for, 437.
of blood plasma, relation to vitamin D deficiency of dairy cattle, 675.
oxide as corrective for cryolite injury of fruit, Tenn. 519.
requirements of plants, Mass. 740.
solubility in dolomite and magnesic limestone in 4 percent citric acid solution, effect of particle size, Mass. 862.

Maidenhair fern spore formation, effect of photoperiod, 457.
Maine Station, report, 430.
*Malacosoma*—
*americana, see* Tent caterpillar, eastern.
*disstria, see* Tent caterpillar, forest.
Malaria—*see also* Mosquitoes *and Anopheles.*
avian, immunity in, 821.
condition of blood in, while under treatment with vitamin C, 716.
parasites, action of immune serum in vitro, 821.
parasites, strains or races of, 821.
Male fern, extract, insecticidal properties, 521.
Malnutrition, types, Nev. 540.
Malt, diastatic power—
comparison of methods for determination, 302.
electrometric determination, 302.
Maltose fermentation activators, as affecting baking, 441.
Malts, evaluation, in flour technology, relation to $\alpha$- and $\beta$-amylases, 441.
*Mamestra picta, see* Zebra caterpillar.
*Mamiania,* new taxonomy, 40.
Mammals—*see also* Animals *and specific kinds.*
inheritance of characters in, 608.
injurious to agriculture in Kansas, control, Kans. 363.
mammary gland growth, hypophysectomy and replacement therapy in relation to, Mo. 182.
of British Columbia, ectoparasites of, 364.
small, and forest insects, 790.
Mammary—
duct growth, hormone control, 608.
gland, bovine, synthesis of milk fat in, Ark. 94.
gland, ejection of milk from, 674.
gland, lactating, effect of nembutal anesthesia on, 674.
gland of cow, fat metabolism, 674.
gland of cow, pH of, 674.
glands, comparative anatomy, 47.
tissue, streptococcus infection of, examination of milk for, 109.
Man and animals, relation to environment, Me. 410.
Man, vitamin $B_1$ deficiency in, blood picture and symptoms, 669.
Manganese—
and iron concretions in Dayton soils, 451.
and vitamin $B_1$, metabolic interdependence, 565.
availability in natural and precipitated manganese carbonate, 389.
deficiency during embryonic development of chicks, effect on adult fowls, 811.
distribution in pea seed, relation to marsh spot, 212.
Manganese—Continued.
effect on hatchability of eggs, Wis. 382.
in biological materials, microdetermination, 727.
in human organs at various ages, 562.
role in biological synthesis of ascorbic acid, 422.
role in poultry nutrition, 386.
sulfate as safener for lime-sulfur-lead arsenate spray mixtures, experiments, Conn.[New Haven] 652.
use by perotic chicks, Wis. 95.
Manganous compounds, oxidation by microorganisms in soil, 28.
Mango diseases, control, Fla. 635.
Mangoes—
fruit bearing, relation to growth, 341.
pollination, Fla. 625.
studies, P.R.Col. 625.
Manila hemp, *see* Abaca.
Mantids, Asiatic, egg content and nymphal production and emergencies in oothecae, 219.
Manufacturing activities, fluctuations in, shown by United States census, S.C. 551.
Manures, analyses, N.J. 314.
Maple—
bleeding canker, due to *Phytophthora cactorum,* 513.
Norway, bleeding canker, U.S.D.A. 201.
Norway, new diseases of, 360.
products industry in Garrett County, Md. 407.
sirup, removal of lead in, by base exchange material, 301.
sirup, uses for, N.Y.State, 156.
trees, types of cankers on, symptoms, 215.
*Verticillium* disease, control, Ohio 501.
Mare serum hormone, effect on male and female mice, 613.
Mares—
nonpregnant, gonadotropic hormone in, 612.
oestrous cycle following removal of foetus at various stages of pregnancy, 183.
Philippine, gestation period, 236.
pregnancy in, chemical test for, 757.
reaction to teasing, relation to condition of uterine cervix, 757.
reproduction in, art of mating, 105.
reproduction in, clinical and experimental observations, 612.
time of breeding and sexual vigor in, and changes in reproductive organs, Mo. 182.
treatment with gonadotropic hormones, ovulation and descent of ovum in Fallopian tube after, 184.
Market—
gardening, *see* Truck crops.
organization, changes in, 405.
reports, U.S.D.A. 122, 267, 556, 694.
variations, seasonal, importance to Iowa farmers, Iowa 556.

Marketing—*see also special products.*
agricultural products, use of farm trucks for, Ind. 264.
and food supply, New England Research Council on, proceedings, 693.
Marrow cultures, 243.
*Maruca testulalis*, studies, Hawaii 517.
Maryland Station, notes, 288, 719, 864.
Maryland University, notes, 864.
Massachusetts Station, notes, 864.
Massachusetts Station, report, 862.
Mastitis—
apparent complex nature of causes, 538.
artificially induced, changes in milk from, 675.
chronic streptococcus, control, 247.
development and spread, Wash. 242.
development, relation to changes in chemical composition of milk, 673.
heavy corn feeding as contributory factor, 674.
housefly as vector, 679.
infected milk, detection by portable electrometric device, 109.
infected udder quarters, bacterial development in milk from, Wash. 238.
infection, spread of, Nebr. 814.
short-wave diathermy treatment of, 674.
streptococci, detection, improvement of Hotis test for, 538.
streptococcic, collection of milk samples for, Mich. 542.
streptococcic, treatment by infusion of udder with entozon, 679.
studies, 247, N.H. 823.
tests for determining in dairy cattle, N.J. 677.
Mating responses in spayed female rat, estrogen-progesterone induction of, 331.
May beetles, control, Ky. 518.
Meadow seedings, effects of combine on, Ohio 480.
Meadows—*see also* Grasses *and* Pastures.
effect of potash dressings on, Mass. 759.
Mealworms, habits, life history, information as to rearing, U.S.D.A. 377.
Mealybug—*see also specific host plants.*
azalea, notes, Ala. 519.
Comstock's, on apple and catalpa, 657.
Comstock's, on apples, 221.
long-tailed, on citrus and avocado, biological control, 222.
long-tailed, biological control, 524.
Mealybugs—
in Guatemala, new species of gall midge on, 223.
in well sprayed and fertilized orchards, factors responsible for greater injury, 798.
on greenhouse strawberries in Montana, U.S.D.A. 344.
studies, U.S.D.A. 84.
Meat-and-bone tankage proteins, biological value, 530.
Meat—*see also* Beef, Lamb, Pork, *etc.*
and meat products as sources of essential dietary factors, 703.
and meat products, vitamins in, 276.
animal carcasses, fat in relation to quantity and quality factors, 381.
curing, chemistry of, 382.
experiments with, Wash. 229.
flavor in, factors affecting, 268.
home canning, effectiveness of heat penetration in, N.Dak. 844.
preparation, freezing, and storage, N.Y.State 701.
scrap, quality of protein in, relation to growth rate of chicks, Ky. 528.
storage in community freezer lockers, Wash. 229.
vitamin $B_1$ assays, 132.
*Megninia columbae* in fowls, 400.
*Melampsora lini*, new physiologic races, 785.
*Melanconis*—
*corni* n.sp. notes, 596.
cultural histories, 596.
*juglandis caryae* n.var., notes, 596.
*Melanophila fulvoguttata*, *see* Hemlock borer.
Melanose control, 358.
*Melanotus communis*, notes, Fla. 651.
*Meligethes aeneus*, biology and control, 218.
*Meliola* on new host genus, U.S.D.A. 783.
Melon insect pests, control, Mo. 217.
Melons from different regions, variation in solids of juice, Calif. 337.
Melonworm, notes, Fla. 650.
Melting point microapparatus, electric, 588.
Mendelism and Darwinism, pro and con discussion, 324.
Mercury compounds, antispirochetal action in vitro, 822.
*Meristacrum asterospermum* n.g. and n.sp., description, 649.
*Mesosetum* new species, 597.
Mesquite girdler, notes, 662.
Metabolism—
basal—
of Chinese children, 412.
of Chippewa Indians and Eskimos, 127.
of Indiana University women, 127.
of rats, effect of protein and exercise at different ages, 271.
of the Maya Quiché Indian, 128.
rate of normal individuals in New Orleans, 706.
diseases of, 425.
microbial, significance to microbiologist, 466.
total energy, of rats, effect of protein and exercise at different ages, 271.
*Metapedias pyensoni*—
n.sp., description, 228.
notes, 228.
Metaphosphates penetration and availability in soils, Del. 22.

Meteorological—
changes, association with variations of ionization in $F_2$ region of ionosphere, 157.
glossary, 446.
handbook, 156.
literature, agricultural, non-Norwegian, bibliography, 446.
observations, Me. 306, U.S.D.A. 156, 446, 590.
records, summary, 1889–1938, Mass. 159.
report, Wyo. 446.
research, recent developments in, 17.
work of Florida Station, Fla. 589.
Meteorology—*see also* Climate, Rainfall, Temperature, Weather, *etc.*
ecological aspects, 158.
of South Africa, 305.
papers on, Me. 306, U.S.D.A. 157, 446, 590.
semipopular treatise, 156.
Methane production by cattle, estimation, 669.
Methionine—
and cystine for growth and lactation, 669.
as dietary lactagogue, 667.
Methyl bromide—
as fumigant, 516, 526.
dispenser for use in fumigation of quarantined products, U.S.D.A. 83.
Methylene blue and resazurin reduction in milk, relation to dissolved gases in, Vt. 816.
2-methyl-1,4-naphthoquinone, antihemorrhagic activity, 736.
2-methyl-3-phytyl-1,4-naphthoquinone and vitamin $K_1$, identity, 586, 587.
2-methyl-3-phytyl-1,4-naphthoquinone, synthesis, 586.
*Metorchis conjunctus*, notes, 821.
Mice—*see also* Rodents.
birth weight and litter size in, relation, 180.
coat texture character, rex, in, 327.
control in orchards, 518.
control project, 517.
field, life and habits, 514.
linkage data on rex character in, 180.
mating, ovulation, and oestrous smear in, relation to time of day, 614.
mutation from agouti with recessive spotting to dominant spotting in, 327.
pituitary dwarfism in, 184.
polydactylous strain of, 327.
size character tail ring number in, effect of specific genes, 327.
taillessness in, inheritance, 180.
Microbiology, International Congress, papers, 466.
Micromelia in adult fowls caused by manganese deficiency during embryonic development, 811.
*Micromonospora* taxonomic notes, 607.
Micro-organism, acidfast, in tonsillar tissue of swine, 398.
Micro-organisms—*see also* Bacteria *and* Organisms.
and fermentation, textbook, 752.
and pantothenic acid, 468.
antagonistic to disease-producing bacteria, soil as source, 456.
causing food spoilage, action of acetic acid on, 346.
death by irradiation, theoretical studies, 467.
definition of growth factor, 467.
fermenting, effect of radioactive substances on, 468.
in soil, development, effect of environmental factors, 26.
inoculated into sterilized soil, survival, 27.
introduced into soil, survival, 311.
modes of action of monochromatic ultraviolet radiation on, 467.
modifications induced by growth substances, 468.
scum-forming, new method for prevention, 436.
soil and higher plants, interrelations, N.J. 593.
soil, capable of decomposing creatinine, enzymes of, 467.
soil, metabolism and functional relations, Fla. 592.
type culture collections, variations in, 467.
*types and distribution in Florida soils*, Fla. 592.
*Microsphaera diffusa*, notes, 641.
Microtome, rotary or sliding, two-plane cutting attachment for, 32.
Midges, aquatic, biology, 372.
Milk—
and milk fat, effect of dinitrophenol administration on, 674.
and milk fat production, effect of endocrine secretions, N.J. 676.
and milk products, packaging, sanitary aspects, 101.
as food throughout life, Wis. 270.
as public utility, Wis. 117.
Babcock test, estimating fat in, better method for, 674.
bacterial count, effect of operations at pasteurizing plant, 100.
boron content increased by feeding boric acid, 531.
bottle, paper, efficiency and practicability, Mass. 814.
carotene and vitamin A in, effect of feeding pea vine silage, 815.
certified, vitamin C in, effect of pasteurization, 282.
changes in chemical composition, relation to development of mastitis, 673.
chocolate-flavored, selecting, Mass. 862.
chocolate, nutritive value of, Mass. 843.

Milk—Continued.
chocolate, physical characteristics, factors affecting, 104.
coagulation temperature, factors affecting, 815.
color and flavor, effect of seven types of roughage, 673.
constituents, precursors of, Mo. 238.
cooling, cost of ice v. electric refrigeration, Ark. 94.
cooling methods on farm and effect on quality, Nebr. 828.
cost of production in Montreal region, 837.
cost of transporting to Boston, Vt. 837.
curd tension, reduction by addition of sodium salts, 539.
daily sales of distributors and effect of 1 ct. per quart increase in price on consumption, Me. 405.
distribution of gross receipts, production, percentage of butterfat and uses, Wyo. 551.
dried, substitutes for in poultry feeding, Miss. 529.
during lactation period, variations in chlorine, catalase, and pH values, Mo. 238.
effect of heat treatments on stability of ascorbic acid and on development of oxidized flavor, 816.
ejection, factors involved in, 391.
ejection from mammary gland, 674.
ejection from udder, effect of excitation, Ky. 535.
examination for streptococci of mastitis, 109.
exposed in three types of paper containers, effect of sunlight on flavor and ascorbic acid in, 539.
farm sales in Ohio markets, Ohio 265.
farmers' cooperative associations, base allotment or quota plans used by, U.S.D.A. 839.
fat in ration, relation to butterfat production, 675.
feed flavors in, survey, 673.
flavor, effect of alfalfa-bromegrass pasture, Mich. 101.
flavor, effect of copper-nickel alloys on, 393.
flavor, relation to dietary factors, N.J. 676.
flavored with water extract of cocoa, nutritive value, Mass. 843.
from udder quarters infected with mastitis, bacterial development in, Wash. 238.
goat's—
and cow's, effect of thyroxine on yield and composition, Mo. 759.
and its supervision, 392.
evaluating quality in, 392.
vitamin C in and curd tension, Mo. 238.

Milk—Continued.
Guernsey, maintaining color and flavor in, N.J. 240.
homogenized, control of sediment in, 673.
improving flavor and keeping quality with various anti-oxidants, Mass. 814.
in reducing diets, use, 703.
iron content, effect of supplemental iron in dairy ration, Mass. 813.
irradiated, effect on storage of nitrogen and acid-base minerals in children, 282.
irradiated evaporated for infants, 283.
lecithin content of foremilk, middle milk, and strippings, Wis. 101.
lecithin in, and possible relation to oxidized flavor, effect of feeds, 539.
losses on boiling, 703.
marketing in areas where farmers were selling whole milk, Ohio 551.
marketing in New England, studies, 698.
mastitic, rapid detection by portable electrometric device, 109.
methylene blue reduction test, effects of temperature and addition of sugars, Mo. 238.
mixed herd, seasonal variations in fat and solids-not-fat in, Mo. 238.
nicotinic acid in, 713.
oxidized flavor—
development, effect of condensing, 393.
development, effect on iodine number of phospholipid fraction of milk, 392.
in, effect of elimination of oxygen from, 240.
in, papers on, 673.
relation to iodine and peroxide numbers in, 816.
oxygen content, variations in, 240.
pasteurization efficiency, determining, Wis. 101.
pasteurization, time-temperature relations in, 673.
producer responsibility to consumer, Ohio 257.
production—
alfalfa hay for, cystine as possible deficiency, 675.
comparative value of Korean lespedeza and soybean and alfalfa hays, Mo. 238.
dried grapefruit pulp for, 675.
improvement through breeding, N.Y.State 815.
in Cabot-Marshfield area of Vermont, supply responses in, U.S.D.A. 555.
input-output relations, 405, Del. 94, U.S.D.A. 693.
products, dried, determining riboflavin in, 152.
products in rations of breeding hens, value, West.Wash. 236.
proteins, digestibility, effect of cocoa on, 674.

Milk—Continued.
proteins, effect of cocoa upon digestibility, Mass. 843.
rancid flavor in, cause and control, 240.
raw market, hemolytic streptococci in, 817.
resazurin and methylene blue in, potentiometric studies, 537.
sales, seasonal variation in, Me. 405.
samples, aseptically drawn, bacterial and leucocyte content, Ky. 535.
samples, collection for streptococcic mastitis test, Mich. 542.
secretion, energy requirements, Mo. 238.
secretion, physiology of, recent advances in knowledge, 391.
secretion, relation to pituitary gland hormones, Nebr. 814.
serum, from known infectious abortion reactor cows, agglutination titres, 542.
skimmed, *see* Skim milk.
sold by producer-distributors in smaller and larger markets, Me. 405.
solids, dry, effect on keeping quality and batter stability of sponge cakes, Minn. 411.
solids, dry, water sorption of, comparison of methods of determination, 393.
solids, heat-deposited, effectiveness of alkalies in removing, 817.
solids-not-fat content, Mo. 238.
solids-not-fat, factors affecting variability, N.H. 814.
supplies, allocation among contiguous markets, 405.
susceptible to becoming oxidized, relation of bacteria and oxygen to flavor, Vt. 676.
sweetened condensed, use of dextrose and sweetose in, 104.
tank sizes and power requirements, 404.
transportation and country assembly, 405.
vitamin A and carotene determination in, 668.
whole v. filled, comparative nutritive values, Wis. 95.
yellow color of, measurement, N.J. 101.
Milking—
completeness of, factors affecting, 674.
open-shed v. stable, Wyo. 535.
Mill, hammer, as important nursery implement, 632.
Millet—
culture experiments, Wash. 185.
merits as emergency forage crop, N.Dak. 481.
pearl, as temporary pasture for beef cattle, S.C. 529.
pearl, strain tests, Fla. 616.
proso, in poultry rations, S.Dak. 671.
Siberian, yields of varietal leaders, N.Mex. 760.
variety tests, N.Mex. 48, Wash. 185.
Mills, Allis-Chalmers and Buhler automatic experimental, comparison, 295.
Milo v. corn as main portion of lamb ration, Colo. 235.
*Mineola vaccinii*, *see* Cranberry fruitworm.
Mineral—
constituents of wheat, 707.
deficiencies in cattle, effects, Nev. 540.
deficiencies in Tropics, desirability of studies on, 425.
metabolism, 845.
metabolism of pullets, 811.
oils, *see* Oils.
Minerals—
acid-base, storage in children, effect of irradiated milk, 282.
identification in soil colloids, 593.
Mink breeders, primer for, 183.
Minks—
botulism type C in, 686.
digestibility of animal products and cereals by, 382.
summer food on Montezuma Marsh, New York, 791.
Ministry of supplies, establishment in France, U.S.D.A. 555.
Minnesota Station, notes, 719.
Minnesota Station, report, 430.
Minnesota University, notes, 719.
Mississippi River, lower, speed of stage transmission in, 305.
Mississippi Station research, benefits to agriculture from, 143.
Mite, new, from frontal sinus of dog, 252.
Mites, effect of selenium introduced into plant tissues on, 654.
Mitochondria in plants, 171.
Molasses—
as substitute for corn for beef calves, Mo. 229.
as supplement to Napier grass, Hawaii 528.
beet, as supplement to native hay and to alfalfa hay for cattle, Wyo. 535.
blackstrap, in lamb-fattening ration, effect, 235.
blackstrap, v. corn in livestock ration, Miss. 805.
feed for poultry, salt balance of, Hawaii 528.
spraying of rough herbage, effect on palatability, 96.
value in steer-fattening rations, Fla. 666.
Mold growth, propionic acid and its calcium and sodium salts as inhibitors, 673.
Mold inhibitors on dairy products, effectiveness of propionates, 673.
Molds—
homothallic water, role of hormones in sexual process, 318.
naming, 39.
Moles, destruction, Kans. 363.
*Moniezia* sp., efficacy of nonconditioned phenothiazine against, 543.

*Monilinia azaleae* n.sp. pathogenic on leaves, shoots, and fruits of *Rhododendron roseum*, 514.
Monkeys, parasites of, P.R.Col. 677.
Mononucleosis, infectious, hematologic and pathologic aspects, 243.
Montana College, notes, 864.
Montana Station, notes, 144, 864.
Montana Station, report, 718.
Moringa seed oil, 150.
Mormons of Rocky Mountain area, type of village life among, Minn. 409.
Mortgage indebtedness on farms, Wis. 117.
Mortgages, farm, conditions of foreclosure, 405.
Mosaic diseases, *see specific host plants*.
Mosquito—
  larvae, rearing and effect of diet on resistance to rotenone and nicotine, 92.
  repellents, studies, 659.
  surveys, local, in Minnesota, importance of, 799.
  Thibault's, biology, Ark. 84.
Mosquitoes—*see also Anopheles and* Malaria.
  as vectors of equine encephalomyelitis, 819.
  breeding, relation to shade, 525.
  collected in Maine, Me. 364.
  collections at Charleston, using New Jersey light trap, 652.
  control, Conn.[New Haven] 651, N.J. 651.
  problem in a metropolitan area, 516.
  studies, Del. 85, U.S.D.A. 84.
Mothproofing, studies, 516.
Motion pictures, application to study of stability and meltdown properties of ice cream, 673.
Motors, single phase electric for the farm, Iowa 828.
Mourning-cloak butterfly, seasonal history on hops, 85.
Mouse typhoid, populations infected with, role of inborn resistance factors in, 476.
Muck, swamp, for soil improvement in Connecticut, Conn.[New Haven] 594.
Mucoraceae, spore dispersal in, 346.
Mucorales, sexuality in, 468.
Mules, minimum lethal dose of selenium as sodium selenite, 543.
*Multiceps glomeratus*, larval stage in rabbits and mice, 686.
*Murgantia histrionica*, *see* Harlequin bug.
*Musca domestica*, *see* Housefly.
Muscle, mammalian, carnosine and anserine in, 588.
Muscular dystrophy—
  in rabbit, cure by α-tocopherol and its effect on creatine metabolism, 382.
  in suckling E-low rats, prevention, 806.
  prevention with vitamin E in guinea pigs, 669.
  preventive effect of wheat germ oils and of α-tocopherol, 382.
Mushroom—
  bubbles or *Mycogone* disease, N.J. 635.
  houses, equipment for burning sulfur in, Ohio 833.
  insects, N.J. 651.
Mushrooms, infectious disease of undetermined cause, Mo. 201.
Muskmelon—
  diseases, epidemiology and control, S.C. 501.
  diseases, spraying tests for, N.J. 635.
  downy mildew resistant variey, Fla. 634.
Muskmelons—
  control of defoliation and improvement of fruit quality, 201.
  from different regions, variation in solids of juice, Calif. 337.
  growth and maturity, relation to manure, lime, and potash, 59.
  manure experiments with, Ark. 626.
  studies, P.R.Col. 625.
  varieties, Mo. 190.
  variety tests, S.C. 488.
  yields under irrigation, Okla. 190.
Muskrat-vacant habitats, natural restocking, 791.
Mutation—
  among progeny of agouti-and-white mice, 327.
  in plants, X-rays for inducing N.Y. State 193.
  to curly in rats, Wis. 42.
*Mycobacterium*—
  taxonomic notes, 607.
  *tuberculosis avium*, spontaneous dissociated variants, behavior in vivo, 822.
Mycological Society, British, contributions from Nomenclature Committee of, 752.
Mycorhizae and growth of *Pinus* and *Araucaria*, 463.
Mycorrhizal response to experimental variations in a selected soil, 468.
*Mycosphaerella*—
  *cercidicola* n.comb., notes, 214.
  *citrullina* on ornamental gourds, U.S.D.A. 500.
  *nyssaecola* n.comb., notes, 648.
  *rubina*, notes, N.J. 635.
*Myelois decolor*, parasite of, 379.
*Myelophilus* spp. in Great Britain, ecology and control, 227.
Myrianiales, anthracnose fungi of, fruiting phases, 346.
*Myrmelachista ramulorum* in coffee groves, poison bait for control, P.R.Col. 651.
Myxomycetes, plasmodium, mechanism of death by cold in, 458.
*Myzus*—
  *cerasi*, *see* Cherry aphid, black.
  North American species, revision, U.S. D.A. 369.
*Nandina*, *Cercospora* leaf-spot disease, U.S. D.A. 201.
Naphthalene and nicotine mixtures as fumigants, toxicity studies, 365.

Naphthoquinones—
antihemorrhagic activity, 14, 585, 586.
of vitamin $K_1$ type of structure, synthesis and experimental work with, 735.
Napier grass—
breeding, Fla. 616.
*corn, sugarcane, and sorghum, ensiled*, comparison of loss of nutrients, Fla. 666.
cutting and strain tests, Hawaii 479.
for pastures, value, Fla. 616, 666.
fresh, digestibility, Fla. 666.
growth, yield, and composition, effect of frequency of cutting, 764.
improvement, Fla. 616.
molasses as supplement to, Hawaii 528.
strain tests, Fla. 616.
*Narcissus*—
bulb diseases, control, West.Wash. 202.
plantings in western Oregon, bulb nematodes affecting, 782.
stripe-A virus disease, 346.
Nebraska Station, report, Nebr. 862.
Necrology notes, 576.
Nematode—
as parasite of Mormon cricket, 797.
banana, in United States, 780, 782.
bulb, in narcissus plantings in western Oregon, 782.
bulb, on onions in New York, U.S.D.A. 782.
disease of rubber-bearing plant, 362.
diseases of plants in the U.S.S.R. 362.
eye worms from a mature buck deer in Sequoia National Park, 249.
fowl, food of, 254.
*Fusarium*-wilt experiments at Lumberton, North Carolina, 780, 782.
meadow, distribution and relation to *Fusarium* wilt of cotton, 780, 782.
parasitic in Japanese beetle, continued culture of, 800.
resistance, quick test in plant breeding programs, 780, 782.
root gall, studies, 362.
*ruminant problem, view of*, 246.
stem, as pest of agricultural crops in U.S.S.R. 362.
stem, on potatoes, field experiments, 362.
wheat, in the Crimea, 362.
Nematodes—*see also* Root knot nematode.
anabiosis in, distribution, mechanism, and significance, 821.
bulb or stem; soil treatment for, 346.
control, effect of crop rotation on, 782.
free-living terricolous, fungi destructive to, 649.
from gastrointestinal tract of a ram, effect of commercial phenothiazine on, 545.
gastrointestinal, anthelmintic for, 543.
gastrointestinal, reinfection of grazing sheep with, 821.
*gut contents, hematological studies*, 686.
Nematodes—Continued.
in cereals and in root and tuber crops, problems and control, 362.
in Hawaii, and hosts, check list, U.S.D.A. 345.
in tomato plants and in soil, 362.
inducing uniform soil infestations of, as aid in research, 782.
infective, exsheathing and sterilizing, 395.
injuring winter wheat, 362.
*of superfamily Dorylaimoidea*, monograph, 82.
on cereals, 362.
parasitic, culture, 821.
parasitic in sheep, numbers and pathological effects, 821.
pathogenic, for domestic fowls, 400.
plant, council on, 782.
plant-parasitic, methods and technic used in study, 362.
reniform, in Hawaii, host plants of, 649.
*role in Lemoine disease of peonies*, 360.
separating from soil, methods of clearing screen residues, 649.
*Nematodirus leporis* parasite of cottontail rabbit, 791.
*Nemorilla notabilis*, notes, 222.
*Neoaplectana glaseri*, continued culture of, 800.
*Neorhacodes*—
*brevicauda* n.sp., description, 804.
*enslini*, description, 804.
*longicauda n.sp., description*, 804.
*Neurospora*—
*crassa*, mutations, chromosomes, and crossing-over in, 468.
*sitophila*, mechanics of spermatial and conidial fertilization in, 346.
spores, reversible heat activation of respiration, fermentation, and germination in, 467.
*tetrasperma*, effects of heat and irradiation, 468.
Nevada *Station, report*, 574.
New Hampshire Station, notes, 864.
New Hampshire Station, report, 863.
New Hampshire University, notes, 864.
New Jersey Stations, reports, 718.
New Mexico Station, notes, 864.
New Mexico Station, report, 143.
Newcastle disease virus in chick embryo, passive immunity to, 819.
News, nature of, 842.
New York Cornell Station, notes, 288.
*Nezara viridula, see* Stinkbug, southern green.
Nicotinamide—
and cozymase in blood, 714.
in foods, determination, 732.
in vivo, chemical reactions, 421.
Nicotine—
administered to insects, toxicity studies, 653.
and naphthalene mixtures as fumigants, toxicity studies, 365.
bentonite as substitute for arsenic sprays, *Mo.* 659.

Nicotine—Continued.
distribution between water and petroleum oils, 219.
oil spray, field tests with, Ky. 518.
silicotungstic acid determination, errors and new technic, 584.
use in orchard test plats, 523.
Nicotinic acid—
and cozymase, relation in blood of pellagrins and normal persons, 420.
connection between two functions of, 857.
effect on gastrointestinal motility, 567.
in biological material, quantitative estimation, 298.
in body fluids in pellagra and in health, retention, 714.
in cure of pellagra, 859.
in foods, 713.
in foods, determination, 732.
in treatment of neurological diseases, 711.
role in human nutrition, 425.
synthesis, in body of sheep, 532.
Night blindness, human dietary, experiment in, 131.
*Nigrospora sphaerica* on banana, 511.
*Nippostrongylus muris*, cellular reactions during immunity to, 821.
Nitrocellulose imbedding, speedier and less costly method of concentration in, 746.
Nitrogen—
applications to sugarcane, proper proportioning and timing, 485.
availability studies, N.J. 592.
balance in preschool children, 273.
conservation, Tenn. 448.
cycle in soils, role of algae in, 312.
endogenous and exogenous metabolism, independence of, 229.
fixation—
biochemical studies, 322.
by *Azotobacter*, adsorbed ions of colloidal clay as factor, 29.
by nonleguminous plants, radioactive nitrogen in study, 604.
from cyanamide and dried blood in soils, Del. 22.
symbiotic, respiratoy enzyme systems in, 40.
free extract, from plant-physiological viewpoint, 455.
free extract of foods and feeding stuffs, symposium on, 231.
in soils under different treatment, Mo. 159.
mineralizable, in soils, Hawaii 448.
of various compounds, retention by soils shown by subsequent plant response, 743.
sources, effect on pH of soil of cotton plats, S.C. 480.
storage in children, effect of irradiated milk, 282.
*Nodonota puncticollis*, see Rose leaf beetle.
Nodule—
bacteria—see also Legumes, inoculation.
and legumes, noneffective associations of, 463.
new growth factor for cultures of, Wis. 6.
formation, relation to nitrogen-fixing efficiency of *Rhizobium meliloti*, 456.
Nodules and roots of bean, soybean, and pea, *Avena* coleoptile assay of ether extracts, 171.
*Nolina texana* buds and blooms, poisonous to livestock, Tex. 544.
Nomenclature—
biological, philosophy of, 215.
of cultivated plants, 595.
problem under present-day conditions, 57.
stability in, 595.
North Carolina—
College, notes, 575.
State College of Agriculture and Engineering, history, 559.
Station, notes, 575.
North Dakota Station, notes, 719.
*Notocelia uddmanniana*, morphology and biology, 222.
*Notolophus antiqua badia* and *Hemerocampa pseudotsugata*, attempts to hybridize, 364.
Nurseries, observational, for herbaceous and woody species, Wash. 160.
Nursery—
implement, important, hammer mill as, 632.
inspection, Conn.[New Haven] 651.
soils and application of potash fertilizers, base exchange properties, 633.
stock, broadleaf, damping-off and storage rots, Nebr. 783.
stock fumigation, Fla. 650.
stock production, Wash. 160.
Nut casebearer, Fla. 650.
Nutrition—see also Diet.
animal, see Animal nutrition.
bacterial, 466.
diseases of, 425.
human and animal, relation to minerals of wheat, Utah 273.
human and animal, trace elements in, 129.
human, vitamin $B_6$ requirement in, 281.
level, assessing by carbohydrate tolerance test for vitamin $B_1$, 851.
level of human subjects, assessing by estimation of vitamin $B_1$ in urine, 851, 852.
physiological and economic bases, 844.
plant, see Plant nutrition.
scientific, seven centuries of, 127.
Nutritional diseases—
extent among children and adults, Fla. 699.
in South, nature of, 859.
Nuts—
nicotinic acid in, 713.
phenological investigations, N.Mex. 57.

Nuts—Continued.
varieties, Fla. 624.
varieties and propagation, Mo. 189.
*Nygmia phaeorrhoea, see* Brown-tail moth.
*Nymphalis antiopa,* seasonal history on hops, 85.
Oak—
Alvord, habit, 324.
and hickory stands, defects reducing quality and yield, Iowa, 66.
forest, evergreen, in vicinity of New Orleans, 603.
girdler, Arizona, notes, 662.
root fungus, serious economic problem in *citrus groves,* 790.
seeds, viability, effect of storage conditions and other treatments, Ark. 65.
trees, dormant buds in, origin and growth, 200.
trees, standing, girdling experiments, 527.
trees, young, importance of soil pore space to, N.Y.State 194.
white, stave bolts, use of cull caliper in scaling, 632.
Oat—
blast, studies, 504.
crosses, reaction to mixed inoculum of smuts and rusts, 74.
crown rust—
biology and control, Ark. 68.
genetics of resistance to, Ark. 68.
in Illinois, U.S.D.A. 782.
longevity of urediospores, Ark. 639.
diseases and winter injury, Ark. 68.
flour, finely milled, antioxidative action on milk, 101.
grain, effect of clipping or rubbing on weight and viability of seed, 765.
hulls, fraction preventing cannibalistic tendencies in chickens, 534.
leaves, reddening in Oregon, Oreg. 351.
smuts, new races, Wash. 202.
smuts, physiologic races, 206.
smuts, races and resistance to, 351.
stem rust in Illinois, U.S.D.A. 783.
stem rust, physiologic races, crossing and selfing studies, 326.
straw, whole and cut, as bedding material, absorptive capacity, 535.
Oatgrass, tall, processing seed of, U.S.D.A. 618.
Oats—
average yields per acre in Ohio, Ohio 257.
breeding, Ark. 48, Fla. 616, Ga.Coastal Plain 617, Mo. 185, Nebr. 759, Tenn. 481, Wash. 185.
crop response in a 3-year fertilized rotation, N.H. 760.
culture experiments, Ark. 48, Ga.Coastal Plain 617, Wyo. 481.
effect of preceding corn interplanted with legumes, Ark. 48.
fertilizer experiments, Fla. 616, Ga.Coastal Plain 617.
Oats—Continued.
forms in chick rations, Nebr. 805.
growing on peat land, Wis. 333.
hybridizing to combine growth for winter pasture, hardiness, and rust and smut resistance, 53.
improvement, Colo. 754.
in poultry rations, S.Dak. 671.
losses from plant diseases, U.S.D.A. 201.
mechanically dehulled, poor germination of, Tenn. 621.
merits as emergency forage crop, N.Dak. 481.
nurseries for winter hardiness studies, West.Wash. 186.
outstanding varieties, N.Dak. 49.
planting tests, Nebr. 760.
seed treatments, Ark. 637.
surface v. furrow drilling, Nebr. 760.
varieties and strains, registration, 53.
varieties recommended, Nebr. 618.
varieties, southern, maintaining identity and pure seed, U.S.D.A. 766.
variety, Huron, new for Michigan, Mich. 53.
variety tests, Ark. 48, Fla. 616, Ga. Coastal Plain 617, Me. 333, Mo. 185, Nebr. 618, 759, S.C. 480, Tenn. 481, Wash. 185, Wyo. 481.
Vicland, tests, Wis. 333.
winter hardiness, including refrigeration, experiments, Ark. 48.
yield increase and profits from better varieties and fertilizers, Miss. 48.
yield increase by fertilizers, Miss. 48.
yields and other data, Nebr. 618.
yields, effect of seed treatments for smut, Mo. 201.
yields, effect of time of seeding, Wis. 49.
yields of varietal leaders, N.Mex. 760.
*Obeliscoides cuniculi* parasite of cottontail rabbit, 791.
*Ocellaria* studies, 468.
*Oesophagostomum*—
genus, division and creation of new genus, 684.
*radiatum,* efficacy of nonconditioned phenothiazine against, 543.
*Oestradiol*—
applied locally to penis of rat, effect 758.
effect of liver and uterus on, 331.
effect on secretion of gonadotropic hormones in parabiotic rats, 330.
Oestriol—
effect of liver and uterus on, 331.
effect on secretion of gonadotropic hormones in parabiotic rats, 331.
Oestrogen—
administration, pituitary mitotic changes after, 331.
and progesterone induction of mating responses in spayed female rat, 331.
and testosterone, tolerance of male and female mice to, 758.

Oestrogen—Continued.
- in ovaries and follicles of laying hens, 332.
- in urine of mares, pregnancy diagnosis by, 613.

Oestrogens—
- metabolism of, effect of liver and uterus on, 331.
- paradoxical effect on sexual development of female rat, 46.

Oestrone—
- action on sexual organs of immature male cats, 45.
- and prolactin interactions, relation to pigeon crop-gland response, 46.
- applied locally to penis of rat, effect, 758.
- effect of liver and uterus on, 331.
- effect on secretion of gonadotropic hormones in parabiotic rats, 331.
- v. diethylstilboestrol in causing oestrus and inducing sexual receptivity in spayed animals, 45.

Oestrous cycle—
- of mares, 179.
- of rats, inhibition, 613.

Office of Experiment Stations, notes, 432.

Ohio State University, notes, 575.

Ohio Station, report, 574.

*Oidium* mildew of papaya, 358.

Oil sprays—
- atomized, effect on truck crops, Wis. 364.
- chemistry, Wash. 217.
- effects in Hood River, 795.
- mineral, selection for insecticides, Wash. 217.
- studies, Mass. 796.
- use on coniferous trees for control of scale insects, 516.

Oils—*see also* Fats *and specific oils.*
- lubricating, Mass. 725.
- mineral, deposits on plant surfaces, determination, 86.
- mineral, ingestion, effect on animal nutrition, Ariz. 561.
- nut, refractive index, N.Mex. 126.
- used in spray program, photosynthetic studies, Wash. 217.

Oleander witches' broom, *Sphaeropsis*-induced, Fla. 634.

Olfactometer, construction and use for muscoid flies, 521.

Olives and olive products, production and trade, 695.

Olsen, N. A., necrology notes, 576.

*Omorgus mutabilis*, notes, 222.

*Oncideres*—
- *cingulatus*, *see* Twig girdler.
- spp., notes, 662.

Onion—
- downy mildew in New York, U.S.D.A. 782.
- eelworm rot or bloat due to bulb nematode, 355, 649.
- fields, winter cover crops for, Mass. 771.

Onion—Continued.
- juice, relation to bacterial growth, Mass. 843.
- maggot, timing experiment leading to control program for, 364.
- mildew, U.S.D.A. 344.
- pink-root disease, serious problem, Colo. 787.
- plasmolysis form in, effect of potassium ion upon it, 460.
- sets, fertilization, Ill. 336.
- thrips—
  - control, 368, Mass. 796.
  - on greenhouse carnations, Wash. 217.
  - seasonal history on hops, 85.
  - studies, Fla, 650, U.S.D.A. 84.
  - transmission of yellow-spot virus by, 797.
  - vector of yellow-spot virus and spotted-wilt virus, 205.
- yellow dwarf, notes, U.S.D.A. 344.

Onions—
- breeding, Mass. 771.
- carbohydrates of edible varieties, effect of storage and processing, Mass. 771.
- Early Grano, growth and yield, effect of seedling treatments, 59.
- grown in sand cultures under glass, effects of deficiency of essential elements, 336.
- produced for seed, diseases of, factors affecting, N.Mex. 69.
- response to manganese on unproductive peat soils, 773.
- sets, cost of production and labor used per acre in producing, Mass. 835.
- studies, P.R.Col. 625.
- vitamins in, effect of winter storage, Mont. 276.
- White Grano, growth and yield, effect of irrigation, N.Mex. 57
- White Grano, selection in, N.Mex. 57.
- yield, and their shrinkage in storage, Mass. 771.
- yield on peat soil, effect of cultivation, 773.

*Ophiodothella*, new taxonomy, 40.

*Ophiola*—
- *striatula*, notes, N.J. 651.
- studies, Mass. 796.

Ophthalmia, periodic, in horses, relation to *Brucella*, Ky. 540.

*Opius lemnaphilae*, notes, 525.

Optical activity, origin and maintenance in living matter, 457.

Orange—
- juice, fresh, ascorbic acid in, effect of refrigeration, 136.
- refuse, dried, feeding value, Fla. 666.
- sneezeweed, ecological characteristics, 243.
- sooty blotch, removal. 358.
- subfamily Aurantioideae, new varieties and new combinations in, 40.

Oranges—
cost of production and grove organization studies, Fla. 693.
Florida, ascorbic acid in juice, seasonal changes, 137.
maturing, plastid pigments in rinds, 496.
Satsuma, major pests of, control, Ala. 794.
Orchard—
cover crops, Wash. 190.
grass, improvement, West.Wash. 186.
insect pests, in 1939, 517.
insects, studies, N.J. 651.
soil management, N.Y.State 775.
soil toxicity, Wash. 190.
Orchards—*see also* Fruits, Apples, Peaches, *etc.*
*fertilizers for, Wash. 190.*
heating, N.Mex. 57.
heating methods, with humidified heat, 628.
irrigation, Wash. 190.
management, Colo. 338.
management costs and production, Kans. 338.
sod culture for, Ark. 56.
spraying, principles of fruit disease control in, 201.
Orchid insects, 218.
Organic matter—
decomposition in soils at different initial pH, 25.
high in nitrogen, functions in soil fertility, Miss. 452.
in eastern Washington soils, maintenance, Wash. 160.
in soil, colloidal nature, Mo. 159.
in soil, determination and composition, Nebr. 741.
in soil, determination, comparison of methods, 300.
in soil, effect of erosion on losses, 311.
maintenance in western Washington soils, West.Wash. 160.
Organisms—*see also* Bacteria *and* Micro-organisms.
pathogenic, genetics of, treatise, 41.
Oriental beetle grubs attacking azalea, methyl bromide fumigation for, 660.
*Ornamental plants, shrubs, and trees, see* Plants, Shrubs, *and* Trees.
*Ornithobilharzia* n.spp., description, 244.
*Ornithodoros*—
*hermsi*—
as vector of relapsing fever, 107, 244.
feeding and molting habits, relation to relapsing fever spirochetes, 228.
*parkeri* in burrowing owl, 216.
spp. in Arizona bat caves, 528.
spp., persistence of *Bacterium tularense in tissues of, 804.*
*Orthaea longulus*, studies, Fla. 650.
*Oryzaephilus surinamensis, see* Grain beetle, saw-toothed.
Osprey, life and habits, 514.
*Ostertagia ostertagi*, efficacy of nonconditioned phenothiazine against, 543.
Ova, mammalian, comparative behavior in vivo and in vitro, 47.
Ova, ovarian, maturation and cleavage figures in, 47.
Ovariectomy, pituitary mitotic changes after, 331.
Ovaries—
APL stimulated, androgenic function in immature rats, 478.
of hypophysectomized rat, effect of oestrogens and androgens alone and in combination with chorionic gonadotropin, 612.
*Ovicides, penetration of, N.H. 796.*
*Ovulinia azaleae* n.g. and n.sp., description, 80.
Owls—
burrowing, host to argasid tick, 216.
horned, of central Wisconsin, food of, 514.
life and habits, 514.
Oxidation, biological, theoretical considerations, 462.
*Oxyptilus*—
*periscelidactylus, see* Grape plume moth.
*regulus* in South India, bionomics, 222.
*Oxytenia acerosa, poisonous to* livestock, Colo. 243.
*Oxyuris equi*—
hematin in intestines of, 686.
infestation in Philippine horses, 251.
Oysters, open shore culture, production of seed and pest control, N.J. 651.
*Pachycrepoideus dubius*, biology, 227.
*Pachyneuron altiscuta*, parasite of Comstock's mealybug, 657.
*Pacific Northwest, selected bibliography of,* 699.
Pacific Ocean currents, relation to climates of the coasts, 19.
Packing industry—
market-sharing in, 405.
market-sharing in, correction, 834.
Paints for rammed earth walls, S.Dak. 589.
Paloverdes, native of Arizona, 324.
Pan American Scientific Congress, editorial, 1.
*Panicum*—
cytotaxonomic studies, 472.
*new species,* 597.
Panleucopenia, malignant, of cats, 820.
*Pantomorus*—
*leucoloma, see* White-fringed beetle.
*peregrinus*, control with methyl bromide, 663.
Pantothenic acid—
and factor W in nutrition of rat, 668.
and micro-organisms, 468.
in tissues of chicks on diets deficient in *it, 668.*
notes, 667.

Pantothenic acid—Continued.
  requirement for growth of rats, 567.
  synthetic, biological activity, 531.
Papaya—
  chemistry and flavor, 630.
  diseases as limiting factors in culture, P.R.Col. 635.
  diseases, cause, appearance, and control, 358.
  fruit, ripening, production of ethylene by, Hawaii 488.
  genetics of, Hawaii 488.
  selection with relation to sex, P.R.Col. 625.
  sterilization treatment, Hawaii 488.
  virus disease, Hawaii 501.
  virus disease, possible vectors, Hawaii 517.
Papayas—
  breeding, Hawaii 488, P.R.Col. 625.
  studies, P.R.Col. 625.
  use in swine rations, Hawaii 528.
  varieties, Fla. 625.
Paper—
  kraft, fold failure in, 303.
  milk bottle, efficiency and practicability, Mass. 814.
Paprika, variety tests, N.Mex. 57.
*Paradexodes epilachnae*, parasite of Mexican bean beetle, U.S.D.A. 373.
Paralysis—
  curled toe, in chicks, riboflavin as preventive, Wis. 95.
  fowl—
    and allied conditions in animals, etiology, Fla. 677.
    progress of work with, 253.
    relation to ruptured yolk, 547.
    studies, Mo. 242, S.C. 540, Wyo. 541.
    therapeutic treatment and value of iodine in relieving symptoms, 112.
    transmission of and resistance to, Idaho 547.
    wheat germ oil in control, 253, 254.
  in chickens, N.H. 823.
  infectious bulbar, role of hog as virus carrier and source of bovine infection, 397.
  infectious bulbar, virus role in fatal bovine, pruritic syndrome, 679.
  sickle hock, in pigs, nutritive factors as preventive, Wis. 95.
Paramphistomiasis, intestinal, of sheep in Sind, 249.
Parasites—
  animal, natural resistance acquired as hosts mature, 821.
  gastrointestinal, in sheep, Ohio 540.
  in domestic animals, in Sweden, 686.
  internal, of cattle and horses, P.R.Col. 677.
  intestinal, of small animals, methods of diagnosis and treatment, 546.
  studies, Conn.[New Haven] 651.
Parasitism, intestinal, duodenal goblet cells and age resistance to, 821.
*Parasyntormon hendersoni*, description, 799.
*Paratetranychus*—
  *afrasiaticus* n.sp., description, 228.
  *citri*, *see* Red mite, citrus.
  *heteronychus* and *P. simplex* identity, 228.
  *ilicis*, notes, Ala. 519.
  *pilosus*, *see* Red mite, European.
  *stickneyi* n.sp., description, 228.
Parathyroid—
  deficiency, effect on reproduction in rats, 667.
  glands of immature rats, effect of testosterone propionate, 615.
*Paratrechina longicornis*, notes, Conn.[New Haven] 652.
*Paratrioza cockerelli*, *see* Tomato psyllid.
*Paratyphloceras oregonensis* n.g. and n.sp. from mink, 525.
Paratyphoid—
  bacilli, isolation and identification, method based upon bacterial motility, 822.
  bacilli, studies, Ky. 540.
  of pigeons spontaneously infected, N.C. 401.
*Pariana*, new species of, 40.
Paris green, particle size relation to toxicity and repellency to Mexican bean beetle, 661.
Parsley stalk weevil, N.J. 651.
Parsnip—
  *Ramularia* blight, U.S.D.A. 344.
  vein banding virus (?) disease, U.S.D.A. 344.
Partridge, Hungarian, spread of, Wis. 82.
*Paspalum* spp., cytological study, 473.
*Passalurus ambiguus* parasite of cottontail rabbit, 791.
*Pasteurella*—
  and *Pasteurella*-like cultures of avian origin, Mass. 823.
  *avicida* and sulfanilamide, simultaneous injection into chickens, duration of immunity following, 400.
Pasteurization—*see also* Cream *and* Milk.
  efficiency, phosphatase test for control, 440.
Pasture—
  areas, vegetational survey, Hawaii 479.
  crops for hogs, comparison, Ky. 528.
  grasses, *see* Grasses.
  herbage, composition, effect of fertilizers, 762.
  mowing doubles palatability and adds to protein content, Miss. 805.
  plants, Illinois, yields and composition, 763.
  plats, clearing, results and costs, N.H. 835.
  records at the Hatch farm, Mo. 185.
  yields, effect of superphosphate, Miss. 48.
  yields, methods of measuring, West. Wash. 238.

Pasture—Continued.
yields, obtained by clippings at intervals of one to seven weeks, 391.
Pastures—*see also* Grasses *and* Meadows.
and grasslands, improvement, N.J. 676.
bluegrass, systems of grazing, comparison, Mo. 229.
carrying capacity, effect of nitrate fertilization, Tenn. 529.
carrying capacity, effect of shade trees, Tenn. 529.
contour furrowing for, Mo. 255.
development in Florida, soil and vegetation surveys, Fla. 592.
effect of fertilizers, Fla. 616.
effects of top dressings with superphosphate, Ky. 479.
efficient production, effect of fertilizers, Utah 482.
improvement, Me. 333, Mo. 160, Nebr. 760.
improvement and management, Iowa 482.
in balanced system of land use, 380.
increasing productivity, Mo. 160.
lowland and upland, value of fertilizing, Ga.Coastal Plain 666.
management, Mass. 759.
old, top dressing experiment, N.H. 760.
permanent, comparison of treatments, N.J. 482.
permanent, establishing under various conditions, Fla. 616.
permanent v. rotation for meat production, 380.
rapidity of development, effect of heavy initial fertilizer treatments, S.C. 481.
studies, 381, Ark. 48, Mo. 185, Wyo. 481.
studies on peat and muck soils of Everglades, Fla. 616.
timbered and clear, relative carrying capacity for grazing, Wis. 382.
top dressing experiments, N.H. 761.
treatments, comparison, and palatability tests, N.J. 617.
yield in terms of known feed equivalents, 380.
Pea—
aphid—
control, 516.
control by natural enemies and old rotenone dusts, Wis. 364.
control experiments in Oregon, 88.
control in Maryland during 1939, 656.
damage to plant, relation to its physiological age, 523.
derris dusts effective against, Wis. 364.
injury, resistance of adapted and nonadapted red clover to, Ky. 518.
injury to pea vines, 87.
not a factor in spread of potato virus diseases, Me. 364.
Pea—Continued.
aphid—continued.
on canning peas, effect of alfalfa plantings, 87, Wash. 217.
predators, resistance to rotenone, Wis. 364.
rate of reproduction on alfalfa plants, 656.
studies, Me. 363, N.J. 651, U.S.D.A. 84.
timing experiment leading to control program for, 364.
cannery refuse, nutritive value and vitamin A activity, West.Wash. 238.
combinations, best annual hay crop, N.Mex. 760.
diseases of Austrian winter field variety, control, U.S.D.A. 786.
diseases, virus, Wash. 202.
insect control, 516.
marsh spot, relation to manganese distribution in seed, 212.
mosaic, three previously undescribed viruses, 645.
near-wilt fungus, site of invasion and mode of advance, 511.
near-wilt, new disease, U.S.D.A. 500.
nodules, ether extracts of, coleoptile assay, 172.
plant, physiological age, effect on recovery from aphid damage, 523.
plants, effects of aphids on, Wis. 364.
plants, injury from horse-drawn dusters, Wis. 364.
proteins, replacement value for those of eggs, Wis. 126.
root rot and foot rot, complex situation and difficulty of control, N.Y.State 788.
root rot of Austrian Winter variety, 782.
root rot, studies, N.J. 635.
roots, effect of calcium deficiency, 644.
roots, isolated, cultured in vitro, auxin products in, 461.
seed treatment beneficial under some conditions, Wis. 345.
seed treatment to prevent rotting in soil, West.Wash. 202.
seed treatment with red copper oxide, S.C. 488.
vine, red-stemmed, toxicity to cattle, sheep, and goats, 680.
vine silage, effect of feeding on carotene and vitamin A in milk, 815.
weevil control, mechanized dusting equipment for, Idaho 549.
weevil, studies, U.S.D.A. 84.
Peach—
aphid, black, control, 83.
bacterial leaf spot, Del 68.
bacterial spot in northeast Texas, U.S.D.A. 788.
borer, studies, U.S.D.A. 83.
buds, late winter injury to, Ark. 57.
buds, varietal resistance to cold injury in 1939, S.C. 488.

Peach—Continued.
- crown gall in the nursery, 356.
- diseases in Massachusetts, U.S.D.A. 500.
- diseases, virus, 510.
- fruits, *thinning*, *Ark.* 56.
- gum-spot disease in South Africa, 356.
- insects, studies, 523.
- leaf-casting yellows, graft-transmissible, 213.
- leaf curl—
  - control, 201.
  - in Idaho, U.S.D.A. 783.
  - in Illinois, U.S.D.A. 783.
  - notes, U.S.D.A. 344.
- little disease, control, Del. 68.
- little-leaf, relation to zinc deficiency, Fla. 357.
- mosaic control, U.S.D.A. 67.
- mosaic, survey and eradication in California, 500.
- orchards, effects of soil covers as conservation practices in, 630.
- parasite project, 517.
- pests, Ohio, present status, 518.
- phony disease, control, U.S.D.A. 68.
- phony disease eradication, Ky. 501.
- season of 1939, climatic conditions, relation to production, 338.
- shoots, secondary and lateral, productiveness, 61, 493.
- trees from embryos grown in sterile media, growth of, N.J. 628.
- trees, magnesium requirements, Del. 57.
- trees, mounding, following ethylene dichloride emulsion and paradichlorobenzene treatment, 83.
- trees, winter injury in New York, U.S.D.A. 344.
- trees, young, importance of soil pore space to, N.Y.State 194.
- trees, young, pruning, Ark. 56.
- X disease in Northeastern States, 201.
- X disease, summary, 214.
- yellows, causes, dissemination, and control, Del. 68.

Peaches—
- breeding and distribution, N.J. 628.
- canned clingstone, annual average f. o. b. prices, statistical analysis, Calif. 692.
- dried, on the ranch, fumigation and shade cloth for protection, U.S.D.A. 83.
- Elberta, blooming data, N.J. 628.
- fertilizers for, Ark. 56.
- freestone, harvesting and handling for canning, 690.
- fruit and tree growth, effect of nitrogen fertilizers, 338.
- genetic composition, Mass. 771.
- injury from use of standard spray schedules, Del. 68.
- losses from plant diseases, U.S.D.A. 201.
- maturity studies, Wash. 190.

Peaches—Continued.
- new, for Western States, U.S.D.A. 196.
- nitrogen fertilization, relation to control of *Bacterium pruni*, 781.
- nutrient-deficiency symptoms in, N.J. 628.
- premature dropping, relation to curculio injury, Del. 57.
- pruning, Iowa 491.
- quality, spray schedules for, Miss. 193.
- saucer fruit shape and other characters, genetic study, 474.
- thinning an essential to quality and yield, Miss. 491.
- trends in South Carolina, 340.
- varieties, Fla. 624, Ga.Coastal Plain 625.
- varieties, catechol tannin content, N.J. 628.
- varieties, testing for resistance to low *temperatures*, Ky. 488.
- variety tests, S.C. 488, West.Wash. 190.

Peanut—
- *Cercospora* leaf spots, control, 780, 781.
- meal, substitution for animal protein in poultry ration, effects, N.C. 389.

Peanuts—
- as feed for swine, deficiencies of, Fla. 666.
- breeding, Fla. 616, Ga.Coastal Plain 617, N.C. 188.
- culture experiments, Fla. 616, Ga.Coastal Plain 617.
- deficiencies as feed for swine, 381.
- dusting for pest control, 519.
- fertilizer experiments, Fla. 616, Ga. Coastal Plain 617.
- rotation experiments under Everglades conditions, Fla. 616.
- runner, hogging off, returns from, Ga. Coastal Plain 666.
- runner, sulfur dusting on, Fla. 616.
- variety tests, Ark. 48, Fla. 616, Ga. Coastal Plain 617, N.C. 188.
- vitamins A and $B_1$ in, 707.

Pear—
- bitter pit and related diseases, Wash. 202.
- fire blight control, growth restriction as aid, 510.
- fire blight, report of conference on, 356.
- fire blight resistance, breeding for, Tenn. 489.
- psylla, an important pear pest, 795.
- psylla, discovery in Washington, Wash. 217.
- psylla survey, 367.
- rots, studies, Wash. 202.
- thrips in prune orchards, West.Wash. 217.
- thrips on prunes, studies, U.S.D.A. 88.
- trees, dwarfing by quince roots, 198.
- trees, young, importance of soil pore space to, N.Y.State 194.

Pears—
Bartlett, respiration and emanation of volatiles from, 61.
*breeding*, 59.
canned Bartlett, annual average f.o.b. prices, statistical analysis, Calif. 840.
D'Anjou, vitamin C in, Wash. 268.
losses from plant diseases, U.S.D.A. 201.
new hardy for Northwest, S.Dak. 774.
pollination, 194.
pruning, Iowa 491.
quality, spray schedules for, Miss. 193.
varieties, Ga.Coastal Plain 625.
vitamin C in, 715.
Peas—
Alaska, protein values for poultry, Wash. 229.
Austrian Winter—
breeding for disease resistance, 76.
placement of dolomite, superphosphate, and basic slag for, 761.
root rot and associated fungi, 780.
rotation experiments under Everglades conditions, Fla. 616.
stem scald and leaf spot of, *Septoria viciae* as cause, 641.
breeding, West.Wash. 190.
breeding stocks show resistance to near-wilt, Wis. 345.
canning, contracts and effects on net returns to farmers, Wis. 117.
canning, fertilizer requirements, Wis. 336.
canning, variety tests, Wis. 336.
cooked in fat, calcium and phosphorus in, 273.
dried, iron availability in, 274.
English, failure of pods to fill properly, Fla. 634.
flat, variety tests, West.Wash. 185.
freezing, culture on special soils, West. Wash. 190.
freezing, fertilizers for, West.Wash. 190.
fresh and frosted, corotene in, 277.
frozen and canned, relative quantities purchased, Wis. 142.
frozen, industry, N.Y.State 772.
frozen-pack, quality, Utah 412, Wash. 268.
frozen-pack, vitamin C in, factors affecting, Wash. 268.
grade, determination from raw product, 627.
*losses from plant diseases*, U.S.D.A. 201.
Michigan, production and marketing, Mich. 53.
quality, reliability of retail prices as guides to, Ohio 116.
rate of seeding, West.Wash. 190, Wis. 336.
studies, P.R.Col. 625.
testing for resistance to aphids, improved method, Wis. 364.
varieties, yields, relation to disease control treatments, Wyo. 502.
Peas—Continued.
variety tests, West.Wash. 190, Wyo. 481.
winter, breeding, Tenn. 481.
*yields of varietal leaders*, N.Mex. 760.
Peasant household, Russian, under Mir and collective farm system, U.S.D.A. 263.
Peat—
bogs in British Columbia, paleoecology, 324.
for soil improvement in Connecticut, Conn.[New Haven] 504.
Pébrine characteristic symptoms in fall webworm parasitized by *Nosema bombycis*, 525.
Pecan—
diseases, U.S.D.A. 510.
insect enemies, summary, U.S.D.A. 519.
leaf scorch studies, 780.
leaves, photosynthetic activity, effect of foliar conditions, 745.
nut casebearer in Texas, insecticide tests, 370.
nut casebearer, studies, U.S.D.A. 83.
scab and rosette diseases, spraying for, 779, 781.
trees, effect of size on subsequent growth and yield, 63.
Pecans—
fertilizer and cover crop tests with, Fla. 624.
food storage, growth, and reproduction in, relation to N absorption, Fla. 624.
fumigation, Fla. 650.
grafting methods and waxes, U.S.D.A. 496.
grown under irrigation, composition, N.Mex. 126.
stigma receptivity and pollen shedding in, 777.
varieties, Fla. 624, Ga.Coastal Plain 625.
variety tests, N.Mex. 57.
yields, factors affecting, 341.
Pectic enzymes, studies, 296.
Pectin-methoxylase activity, determination, 296.
*Pectinophora gossypiella*, *see* Bollworm, pink.
*Pediculoides ventricosus*, destruction of an experimental population of bean weevils by, 652.
*Pediculus humanus corporis*, *see* Body louse.
*Peganum harmala*, poisonous in southwest, 396.
Pellagra—
prevention by nicotinic acid entering into *cozymase*, Wis. 126.
recent research in, public health implications, 859.
role of nicotinic acid in, 425, 859.
*Penicillium*—
and *Aspergillus* and their nitrate metabolism, classification, 467.
and *Aspergillus*, relations, 467.
*carmino-violaceum*, coloring matters of, 464.
*digitatum*, production of epinasty by emanations from, 510.

*Penicillium*—Continued.
*expansum* spores, toxicity of chemicals in aqueous solutions to, 636.
spp., pigments of, 467.
Penitentiary, Louisiana State, composition of population, 410.
Pennsylvania College, notes, 432, 864.
Pennsylvania Station, notes, 432, 864.
Pentatomids attacking tomatoes, control, 368.
Peonies, studies, Ind. 632.
Peony—
anthracnose and *Cladosporium* stem spot, 359.
Lemoine disease and nematodes, 360.
scale on azalea, Ala. 519.
scale on camellia, Ala. 519.
Pepper—
downy mildew resistance, breeding for, P.R.Col. 625.
mosaic, N.J. 635.
mosaic disease resistance, breeding for, P.R.Col. 625.
stem weevil, Fla. 650.
weevil, Fla. 650.
Peppergrass, perennial, distribution and characteristics, N.Dak. 623.
Peppers—
improvement, Mass. 771.
manure experiments with, Ark. 626.
yield and quality, effect of cultural practices prior to field setting, Mass. 771.
*Peridermium strobi, see* White pine blister rust.
Perilla, variety tests, Ga.Coastal Plain 617.
*Perimegatoma vespulae*, new parthenogenetic species, 226.
Permeability—
and porosity, relation, 453.
of soil, relation to noncapillary porosity, 162.
*Peromyscus*—
ecologic and genetic variability within species, 753.
speciation in, 754.
*Peronospora tabacina*—
control, 506, Conn.[New Haven] 505.
sporangial proliferation in, 70.
Perosis—*see also* Chicks, slipped tendon in.
in poults, prevention by choline, 813.
Persimmon—
*Cephalosporium* wilt, known range, U.S.D.A. 344.
oriental, culture, marketing, and uses, U.S.D.A. 630.
trees, girdling to reduce fruit drop in, 64.
Pest control, chemistry in, 793.
*Pestalotia* spp. on ornamentals, N.J. 635.
Petunia, colchicine-induced variations in, 473.
*Pezicula* studies, 468.
*Peziaella lythri* on peony, 359.
*Phaseolus lunatus* and relatives, 168.
Pheasant, ring-necked—
curtailment of egg production due to oviduct fluke, 515.
Pheasant, ring-necked—Continued.
feeding habits in fall and winter, N.Dak. 216.
food habits in Minnesota, 791.
improved ration for starting, Pa. 813.
nesting habits and causes of nest mortality, 515.
Pheasants—
abundance, time and cause, 363.
effect of arsenical grasshopper poisons, 655.
non-injury from grasshopper baits, Wis. 364.
sex invert or intersex, 183.
surviving outbreak of equine encephalomyelitis, test with sera of, 819.
yield of weed crops and waste grain as food for, Wis. 83.
Phenothiazine—
as anthelmintic for pigs, 250.
unconditioned, for removal of intestinal worms of cattle, 543.
Phenylarsenoxides, antispirochetal action in vitro, 822.
*Philonthus quisquiliarius*, life history, 526.
Phloem necrosis destructiveness in West Virginia, U.S.D.A. 783.
Phlox—
irregular flowers in, 341.
powdery mildew, Mass. 783.
*Phoma*—
*betae*, behavior in presence of boron, 641.
*terrestris*, notes, Colo. 787.
*Phomopsis*—
canker and bacterial leaf spot of gardenias, N.J. 635.
*gardeniae*, notes, 359.
*vaccinii*, development of perfect stage, 357.
*Phormia regina*—
response to stimulations of tarsal chemoreceptors, 224
studies, U.S.D.A. 84.
*Phorodon humuli, see* Hop aphis.
Phosphatase values of butter, factors affecting, 673.
Phosphatases, bacterial, 467.
Phosphate—
colloidal, scant increases shown in tests of, Miss. 185.
migration of, Tenn. 448.
wastepond, Fla. 616.
Phosphates—
availability, studies, Ky. 455.
comparison, West.Wash. 160.
effect on crops, Mont. 167.
organic and inorganic, ability to penetrate soils, Nev. 448.
Phospholipoids, extraction from soybean oil meal, Del. 6.
Phosphorus—
absorption by corn seedlings, radioactive isotope study, 174.
absorption by wheat, effect of lime and phosphorus applications, 172.

Phosphorus—Continued.
and calcium, metabolism, 562.
assimilation by mixed soil population and by pure cultures of soil fungi, 28.
balance in preschool children, 273.
deficiency, effect in ration of beef heifers, Wyo. 530.
deficient rations, effect on ovulation, oestrus, and reproduction in dairy heifers, 675.
in phytic acid, availability, effect of calcium in diet, Wis. 126.
in southern soils, effect on crop yields, 30.
in vegetables cooked in fat, 273.
inorganic, in blood of young colts, 810.
inorganic, in dogs, variations with age, 699.
metabolic behavior, 704.
metabolism in normal and rachitic chickens, 386.
organic, in soils, nature of, Hawaii 448.
*oxidation to pentavalent form by carbon* dioxide, 7.
radioactive, in soils, Hawaii 448.
soil organic, nature of, 455.
soil, solubility, Nebr. 741.
total and phytic acid in foods, 426.
transformation during decomposition of plant materials, 313.
uptake by crops, effect of liming, Ky. 455.
Photomicrographic prints in color, technic for making, Tex. 863.
Photomicrography, color, technic for, 456.
Photoperiodic induction—
interrelation of light and darkness in, 175.
relation to photoperiodic inhibition, Mo. 189.
Photoperiodism—
and enzyme activity, Mo. 189.
in plant kingdom, 603.
Photosynthesis—
bacterial, and oxygen, 467.
*capacity for, relation to quantity of* chlorophyll, 317.
in plants, mechanism, 602.
light-mass absorption during, 317.
mechanism of, effect of light intensity on development, 317.
of *Chlorella*, rate, effect of magnesium deficiency, chlorophyll concentration, and heat treatments, 175.
Phthiocol, antihemorrhagic activity, 14, 15.
*Phthirus pubis*, *see* Crab louse.
*Phycomyces*—
*blakesleeanus*, growth test for vitamin $B_1$ in blood, 280.
gametic reproduction by and growth substances, 461.
metabolism of vitamin $B_1$ by, 468.
*Phyllocoptes oleivorus*, *see* Citrus rust mite.
*Phyllophaga*—
*crinita*, life history, 660.
*ephilida*, life cycle, Ky. 518.
*lanceolata*, life history, 660.
*Phyllophaga*—Continued.
of Texas, 800.
*pleroma*, name proposed for *P. plena*, 800.
*renodis*, notes, 800.
*sodalis* n.sp., description, 800.
sp., notes, 516.
spp. of Kentucky, biology and control, Ky. 800.
Phylloquinone—
*α*-, blue alkali salt of, 734.
*α*-, isolation and history of its discovery, 733.
nor-*α*-, aand related compounds, 735.
*Phyllosticta nyssae*, notes, 648.
*Phymatotrichum*—
*omnivorum*—
cotton resistance to, tests, 780.
growth response to inorganic nitrogens, 779, 781.
infection of cotton seedlings in greenhouse by, 779.
pathogenic action, 352, 780, 781.
survival on cotton roots, effect of girdling and topping plants, 780, 781.
root rot—
chemistry of resistance of plants to, 203, 502.
experimental, of retama and corn, 502.
fungus, distribution and condition of Sclerotia in manured and unmanured soils, 781.
relation of age of cotton plants to susceptibility to field inoculations with, 780.
*Physalis angulata* virus diseases, 784.
*Physoderma* species, relation to disease in flowering plants, 346.
Phytin, isolation from soil, 452.
*Phytomonas*—
*lespedezae* n.sp., notes, U.S.D.A. 76.
*sepedonica*, control, U.S.D.A. 786.
*sepedonica* distribution in different parts of potato plant, significance, 352.
*stewartii*—
and *Erwinia tracheiphila*, wilt induction by, comparison, 787.
bacteriophage lytic to, data, 645.
mutation in, Iowa 68.
production and rate of mutation in by X-radiation, 471.
sectoring in colonies, 69.
strains, invasion of sweet corn plants of different ages by, 75.
*tumefaciens*, notes, 356.
*Phytophaga destructor*, *see* Hessian fly.
*Phytophthora*—
*cactorum*—
bleeding canker on Norway maple, 360.
cause of sweetclover root rot, 641.
notes, U.S.D.A. 201.
on maple, 613.
*cambivora* canker on Norway maple, 360.

*Phytophthora*—Continued.
*capsici*, causing rot of Winter Queen watermelon, 512.
*infestans*—*see also* Potato blight, late.
origin, 70.
role of peroxidase in immunity against, 507.
Pickles—
and related products, use of lactic acid in, Mich. 16.
dill, prevention of softening, Wis. 6.
processing and finishing, Mich 17.
Pickleworm—
control, S.C. 519.
notes, Fla. 650.
Pigeon crop-gland response to prolactin, sex difference in, 46.
Pigeons—
effect of restricting cereal diet to corn and wheat, 388.
hypophysectomy of, technic, 332.
parasites of, P.R.Col. 677.
somatic mosaics in, 475.
Pigment, bacterial, new type, 467.
Pigment production in guinea pigs, 329.
Pigmentation of frozen rabbits' skin, 475.
Pigs—*see also* Sows *and* Swine.
bacon, nutrition of, 810.
blood studies, 682.
coconut oil meal for, desirability of limiting, Ohio 529.
cod-liver oil toxicity of, 810.
composition of blood, 105.
cross-breeding tests, Ohio 529.
experimental liver damage associated with hematologic changes, 682.
fattening—
and growing, protein and vitamin supplements for, [N.Y.]Cornell 809.
economy of gain, factors, affecting, S.C. 529.
grazing crops for, Fla. 666.
hybrid v. open pollinated corn for, Nebr. 805.
on corn and tankage, alfalfa pasture v. dry lot for, Wyo. 530.
on rye pasture, protein supplements for, S.C. 529.
protein supplements for, comparison, Del. 95.
finishing, corn and tankage for, Miss. 666.
group feeding experiments, 381.
hard liver disease in, Wash. 242.
hybrid and open-pollinated corn for, Ohio 96.
in dry lot and on Sudan grass pasture, sorghum grains v. corn for, Nebr. 805.
iron-treated cottonseed meal as partial source of protein for, Ohio 529.
litters farrowed by months, and pigs saved per litter, Wis. 117.
mineral requirements, 381, Wis. 382.
morphologic changes in blood associated with vitamin deficiency, 96.
Pigs—Continued.
myocardial lesions from dietary deficiency, 823.
of different weights, percentage of protein in ration for growing and fattening, 381.
on pasture, value of concentrate supplements for, Mo. 229.
on rations containing low protein tankage, meeting protein requirements, 667.
on Sudan grass pasture, protein supplements for, Nebr. 805.
parasites of, P.R.Col. 677.
prices, differences in several markets, Mo. 257.
prices, differences in spread, Wis. 117.
purebred and crossbred, comparative performance, Mo. 229, Nev. 529, 809, S.C. 529.
selling by carcass weight and grade, problems of, Iowa 120.
shipping costs, Nebr. 835.
streamlined, new legless mutation, 609.
transmissible diseases, 678.
type of leg weakness induced by nerve degeneration, relation to diet, 382.
types, factual basis for changing, 381.
unbred gilts, low agglutination reactions in, Mo. 242.
weanling—
comparison of protein concentrates as supplements to corn, Mo. 229.
nutritional requirements, 381.
protein requirements, 381, 384.
vitamin requirements, 381.
wheat shorts for, Miss. 529.
young, protein requirements, 381.
young, value of sugar beet molasses in ration, Utah 385.
Pigweeds and relatives in North Dakota, N.Dak. 488.
Pimelic acid as substitute for yeast filtrate factor, 711.
Pimiento plant, chlorophyll deficient, description, 627.
Pine—*see also* White pine.
beetle—
mountain, destructive infestation in lodgepole pine stands, 526.
mountain, studies, U.S.D.A. 84.
southern, factors in natural control, 662.
western, control, *Thanasimus lecontei* as factor in, 801.
western, studies, U.S.D.A. 84.
beetles in Great Britain, ecology and control, 226.
blister rust, *see* White pine blister rust.
brown tail moth, biology and control, 222.
cankers, *Atropellis* species from, 647.
jack, crowns, lateral growth of, 499.
jack, successful direct seeding on shallow-water-table areas, 499.
loblolly, root and shoot growth, relation to environment, 343.

Pine—Continued.
lodgepole, destructive infestation by mountain pine beetle, 526.
longleaf, direct seeding as practical method of reforestation, 342.
nursery, seedlings, raising, 632.
plantation, bark beetle damage to, Conn. [New Haven] 652.
plantations on bottom lands, management, Ark. 65.
ponderosa—
damage by logging and slash disposal, 343.
growth and mortality, relation to site of trees and cutting method, 633.
index of seed maturity, significance and applicability, 199.
longevity, 499.
racial strains, 65.
sapwood substitution for malt agar in culturing test fungi, 69.
Scotch, size of cones, relation to seed size and yield, 199.
seedlings, effect of nutrient deficiencies, 746.
shoot moth, European, notes, 218.
shortleaf, root and shoot growth, relation to environment, 343.
*Sphaeropsis* dieback and needle blights, 215.
twig blight, types affected by, Wis. 344.
Virginia, witches'-broom on, 215.
white and Scotch, survival of planted trees, N.H. 779.
Pineapple—
bran, use in swine rations, Hawaii 528.
diseases, P.R.Col. 635.
plants, uncombined hexosamine in, distribution, 584.
sister shoots, exposed and covered, distribution of nitrogenous and carbohydrate fractions in, 322.
yellow-spot virus and spotted-wilt virus, identity, 205, 213.
yellow-spot virus on tomatoes, 205, 213 Hawaii 501.
Pineapples, studies, P.R.Col. 625.
Pingue on grazed and protected areas, rate of increase or decrease, N.Mex. 95.
Piñon nuts, grown under irrigation, composition, N.Mex. 126.
Pinworm in poultry, life cycle, Hawaii 518.
*Piophila casei*, see Cheese skipper.
Pituitaries—
from cows in different stages of pregnancy, gonadotropic activity, 179.
of chicks, signet-ring cells in, 614.
Pituitary—
anterior—
changes in vitamin A-deficient rats, Ohio 184.
experimental studies, 757.
gland hormones of cattle, effects in guinea pig of formalin treatment, 477.
Pituitary—Continued.
anterior—continued.
hormone for treatment of ketosis in cows, 543.
mammary growth hormone of, 179.
mammogenic lobule-alveolar factor of, 608.
extract-treated sheep, progonadotropic sera of, 45.
gland hormones, relation to milk secretion, Nebr. 814.
glands of cattle, assay for gonadotropic hormones, Wis. 42.
gonadotropic activity of, action of progesterone on, 613.
hormone, specific activity, essentiality of primary amino groups for, 184.
lactogenic hormone—
action of ketene on, 10.
electrophoretic study, 184.
inactivation by iodine, 758.
substance of sheep, gonadotropic principles in, 45.
*Plagiodera metallica*, injury to Governor plum in Philippines, 526.
*Plagiorchis potanini* in Franklin's gull, 363.
Plague, active immunization against, 823.
Planetree—
blight, London, due to *Ceratostomella* sp., 513.
disease, new locations for, U.S.D.A. 500.
serious disease threatening, 790.
Plant—
acids, biochemical formation from hexoses, 467.
biology applied to agriculture, 636.
breeding—*see also* Heredity *and specific plants*.
programs, quick testing of nematode resistance in, 782.
studies, Colo. 754.
cell membranes, microscopic structure, relation to micellar hypothesis, 35.
cell wall structure revealed by infrared photomicrography, 466.
cell walls, structure and delignified and cellulosan-free cellulose examination, 466.
cells, Golgi material in, 37.
cells, mature, division induced by wounding, 456.
cells, turgor pressure in, determination, 35.
cells, vacuolate, cytoplasmic behavior during division, 606.
chromosomes, *see* Chromosomes.
composition, effect of fertilizers and soil type, Wash. 160.
cuttings, adventitious shoots and roots induced by natural influences and sythetic growth substances, 750.
cuttings, effect of mixtures of root-inducing and other substances on, 750.
cuttings, rooting, value of root-inducing substances in, Fla. 624.
disease survey, Iowa 69, Wash. 202.

Plant—Continued.
diseases—*see also* Fungi *and different host plants*.
and pests, control, 218, 360, Can. 336.
British, common names, emendations to second edition, 785.
check list revision, U.S.D.A. 201, 500, 635, 636, 783.
crop losses from in United States, U.S.D.A. 201.
etiology and pathogenesis, 346.
fungus, distribution in Caribbean region, 347.
in Kiangsu Province, 69.
insect transmission, 516.
miscellaneous, identification, Mo. 202.
notes, U.S.D.A. 635, 636.
of ornamentals, 218, 360, Fla. 635, N.J. 635, U.S.D.A. 500.
on specimens received, laboratory diagnoses and summary of causes, 500.
parasitic, morbid anatomy and causes, 636.
virus, chemical studies, Mo. 202.
virus, in eastern Asia, host index, U.S.D.A. 347.
virus, in Saratov region, 784.
virus, in Volga district and organization of virological work, 784.
virus, microcage for entomovirological experiments, 784.
virus transmission by patch grafting or contact, 346.
fibers, phloem, fine structure of, 170.
food developments, 30.
foods, extra, no need for. Ohio 448.
growth, abnormal, relation to vitamins, hormones, and irradiations, 346.
growth and aeration in wet soils, 316.
growth and break-down of inorganic soil colloids, 165.
growth, effect of—
aeration on, N.J. 597.
alkali salts, 37.
arsenious oxide, arsenic oxide, and antimony oxide, Mass. 740.
boron and indoleacetic acid on, interrelations, 172.
chloropicrin in soil solution, 173.
cryolite, S.C. 518.
growth factors, 36, 455.
minor elements on, N.J. 592.
oxidation-reduction potential, 24.
Zn and other unusual mineral supplements, Fla. 625.
growth-factor-oxidizing substance in *Phaseolus* seedlings, thermolabile, 597.
growth regions of United States, map and check list revision, U.S.D.A. 636.
growth, relation to minute amounts of chemical elements, 450, 456, 599.
growth, response to addition of vitamin $B_1$, 462.

Plant—Continued.
growth responses induced by naphthalene acetamide and naphthalene acetic acid, comparison, 461.
growth substances—
adventitious shoots and roots induced by, 750.
effect on development of cuttings of red clover and alfalfa, 172.
mixtures of, effect, 750.
new interpretation of significance for life-processes, 597.
physiologically active, and responses of plants to, 455.
relation to crown gall, 346.
relation to mechanism of action of radiation on plants, 461.
review, 460.
survey, 467.
growth, vitamin $B_1$ as regulating substance, N.J. 597.
hormones, *see* Plant growth substances.
identification service, N.Dak. 287.
injuries by lime-sulfur sprays, N.H. 783.
insects, control by poison supplied through roots, Ohio 518.
inspections for insect interception at port of New York, 363.
introductions, recording, Hawaii 488.
leaves and stems, attacked by root knot nematode, 780, 782.
material, extraction of hemicelluloses from, 10.
material introduced for testing, U.S.D.A. 324, 594.
material, iodine determination in, 300.
microtechnic, treatise, 464.
nutrients, leaching through soil, effect of cropping systems, Wash. 160.
nutrition, physiological phases, Fla. 634.
organs, inherited size differences in, developmental basis, 753.
pathogens in eastern Asia, host index, U.S.D.A. 347.
pathogens, seed-borne, laboratory technics for detecting, Iowa 68.
pathogens, wind dissemination, 345.
physiology, elements of, treatise, 597.
pigments, seasonal variations in production, 317.
pigments, studies, 745.
products, quarantined, methyl bromide for treatment, U.S.D.A. 216.
root diseases, losses to world agriculture through, 69.
sections, use of translongitome in making and interpreting, 32.
succession in central Iowa, secondary, early weed stage, 745.
taxonomy, ecological aspects, 595.
taxonomy, experimental and synthetic, 595.
tissue reactions, 346.
tissues, alcohol production and use by, 37.

Plant—Continued.
tissues, parasitized, staining vacuolar system of living mycelia in, 346.
tissues, storage, absorption of potassium salts by, 748.
tumors, colchicine in inhibition and death of, 346.
tumors, killing by colchicine, cytological basis, 502.
*virus inhibitors*, 345.
virus inoculations, carborundum powder used in, 72.
virus preparations, size and structure, X-ray evidence on, 345.
viruses—
classification, 784.
*insect relations and comparison with animal viruses*, 784.
*insect transmission of, manner*, 345.
purified preparations, properties, 345, 346.
thermal inactivation rates, 347.
transmission by insects, 784.
world, adaptation and origin in, 32.
*Plantago lanceolata* leaf galls, structure, 69.
Plantain—
*diseases*, P.R.Col. 635.
studies, P.R.Col. 625.
Plants—*see also* Flora *and* Vegetation.
absorption of minerals, relation to lignin, Mass. 725.
aluminum in, 599.
and animals, defense mechanisms in, symposium, *846*.
and fungi, symbiosis, selective action in, 346.
and minerals in soil and health of domestic animals, relation, Wyo. 541.
at low temperatures, decreased water absorption by, cause, 316.
at temperatures above freezing point, cold injuries to, 600.
availability of fixed potassium to, 313.
*British, chromosome numbers in*, 806.
bulbous ornamental, dividing and planting, Miss. 779.
calciphile and calciphobe, relative intake of elements on soils at varying pH, Mass. 740.
calcium content, relation to boron concentration of nutrient substrate, N.J. 597.
chromosome alterations in and atypical growths, 346.
cold resistance in, bibliography, 600.
cultivated, new systematics, 596.
cultivated, nomenclature, 595.
cultivated, origin and behavior, 596.
culture, construction and operation of gravel experimental plats, Ohio 198.
*culture in hormonal media during whole life cycle*, 595.
culture, use of chemical stimulants, hormones, and vitamins in, 460.
cyclic aging and rejuvenation in ontogenesis, theory, 468.
Plants—Continued.
dangerous because of hydrocyanic acid, Wyo. 541.
desert, *see* Desert.
economic, recent investigations, 595.
effects of carcinogenic substances on, 502.
experimental, photography, 32.
flowering—
distribution of self-sterility in, 595.
*effect of deficiency of minor elements*, Ohio 488.
growth, effect of type of container, Mass. 771.
in greenhouse, deficiency symptoms, Ohio 37.
of, possible relation to plant hormones, 455.
of Saline County, Kansas, 168.
time, 316.
*food, absorption of chemical elements important in human nutrition*, Mass. 740.
foundation stock, seed increase, Wash. 160.
glasshouse, diseases, Wash. 202.
growing, fluorescent lamps as source of light for, 176.
growing in water culture, seedling support for, N.H. 32.
*growing without soil by solution culture methods, papers*, 173.
honey and pollen, of United States, U.S.D.A. 227.
inorganic metabolism in, 745.
insecticidal, chemical investigations, U.S.D.A. 84.
intake of elements applied to soil in pairs and singly, Mass. 740.
isolation for virological experiments, 784.
*magnesium requirements of*, Mass. 740.
mechanism of action of radiation on, relation to growth substances, 461.
mitochondria in, 171.
new to Iowa, 745.
observational field plantings, Wash. 160.
of Arizona, new species, varieties, and combinations, 596.
of Iowa, catalogue, supplement, 596.
of Kansas, annotated list, Kans. 596.
of New Mexico, 597.
of sand mounds of Iowa, preliminary list, 745.
of Texas, Tex. 863.
oil-producing, important pests of, biology and control, 218.
oil-producing, virus diseases of, 784.
organic acids of, 745.
ornamental—
culture experiments, Can. 336.
*cuttings, synthetic growth substances for rooting*, Ohio 488.
damping-off of, Mass. 783.
for landscape uses, culture experiments and variety tests, Ark. 57.
fungicides for, 360.

Plants—Continued.
ornamental—continued.
imported, testing, Tenn. 489.
perennial, adaptation to eastern Washington, Wash. 190.
powdery mildew of, U.S.D.A. 360.
propagation, Can. 336.
varietal and propagation tests, Fla. 624.
phosphate availability to, Nev. 448.
photosynthesis, *see* Photosynthesis.
poisonous—*see also* Livestock poisoning *and specific plants.*
of India, 396.
range, Nev. 540.
studies, Wyo. 541.
to livestock in Florida, Fla. 677.
to man and farm animals, descriptions and drawings, 396.
respiration, *see* Respiration.
response to carcinogenic agents and growth substances, 70, 346.
role of potassium in, 598.
seed, modifications induced by growth substances, 468.
translocation in, 599.
transpiration, *see* Transpiration.
transverse reactions of, treatise, 597.
twining, klinostat studies in, 318.
types, nature of cold resistance, Nebr. 740.
upward movement of salt in, 456.
vegetative growth, relation to photoperiod, 318.
vegetative reproduction in by treatments with hormones and heteroauxin, 497.
virus infected, intranuclear inclusions in, 205.
wild, transplanting experiments, 457.
woody, *see* Woody.
*Plasmodiophora brassicae*, *see* Cabbage clubroot.
Plasmodiophorales, zoosporangia and zoospores of, 468.
*Plasmodium*—
*knowlesi*, action of immune serum in vitro, 821.
*praecox*, development, 821.
Plasters for rammed earth walls, S.Dak. 589.
*Platynota flavedana* on roses, control, 369.
*Platyptilia carduidactyla*, *see* Artichoke plume moth.
*Plodia interpunctella*, *see* Indian-meal moth.
Plowing as aid in soil and water conservation, Ark. 22.
Plum—
curculio—
in apples, control, Mass. 796.
life history and habits, in Georgia peach belt, 662.
on peach in Illinois, control, 662.
studies, Tenn. 519, U.S.D.A. 83.
sawfly control, 527.
trees, young, importance of soil pore space to, N.Y.State 194.
Plums—
breeding, 59.
cool storage, 494.
grown under hillculture conditions, response to modifications in cultural treatment, 196.
Hungarian, chemical composition of important varieties, 561.
hybrid, cross-pollination requirements, Wis. 336.
new hardy for Northwest, S.Dak. 774.
pollination, 194.
pollination on Vancouver Island, 340.
pruning, Iowa 491.
quality, spray schedules for, Miss. 193.
variety, new, for Western States, U.S.D.A. 196.
vitamin C in, 715.
*Plutella maculipennis*, *see* Diamondback moth.
Pneumoenteritis of dairy calves, Fla. 677, 680.
Pneumonia—
contagious hog, etiology, 397.
contagious hog, virus, histological alterations of lungs produced by, 398.
in foals, serological classification of etiologic agent, 251.
*Pneumonyssus caninum* n.sp. from frontal sinus of dog, 252.
*Poa ampla* for erosion control, Wash. 160.
*Poa* cross, uniform drought- and heat-resistant $F_2$ of, Mo. 185.
*Poa* new species, 597.
*Podisus maculiventris*, *see* Soldier bug, spined.
*Poecilomyces* sp. extracts, vitamin C in, 598.
Poinsettia blossoms, nectar secretion in, 379.
Poisonous plants, *see* Livestock poisoning, Plants, poisonous, *and specific plants.*
*Polia atlantica*, studies, Mass. 796.
Poliomyelitis—
experimental, vitamin C therapy in, 139.
virus, Lansing strain, transfer from cotton rat to white mouse, 107.
*Polistes fuscatus rubiginosus*, notes, 799.
Pollen—
and pollen substitutes, comparative value for bees, 378.
substitutes, possibilities of, 516.
tube technic, use of acenaphthene in, 464.
Polyarthritis of swine, and experimental *Erysipelothrix* infection, 683.
*Polychrosis viteana*, *see* Grape berry moth.
Polycythemia, studies, 243.
Polydactyly in an inbred strain of mice, 327.
*Polymedon castus*, description, 799.
Polyploidy in papaya, induced by colchicine, Hawaii 488.
Polypores, resupinate, from region of Great Lakes, 512, 785.
*Polyporus*—
*anceps*, isolates from widely separated forest regions, 512.
*ellisianus*, isolates from widely separated forest regions, 512.
spp., from region of Great Lakes, 785.

Ponds, fresh-water, changes in fauna resulting from flooding by sea water, 752.
Popcorn, variety tests, West.Wash. 185.
*Popillia japonica, see* Japanese beetle.
Poplar—
borer, in Parkland regions of Canada, 516.
canker and heart rot resistance, selection for, Wis. 344.
Population—
migration and natural increase, Ky. 557.
of Louisiana State penitentiary, composition, 410.
of New York State, natural increase in, [N.Y.]Cornell 840.
rural and urban, percentages by census periods from 1880 to 1930, N.Mex. 116.
rural, density in southern Appalachians, U.S.D.A. 407.
southern, gainful employment for, 405.
trends and adjustments in Arkansas, Ark. 123, 557.
*Poria*—
species new or little known, 324.
spp., from region of Great Lakes, 785.
Pork—
chops, cooking methods, standardization, Mo. 269.
chops, frozen, keeping qualities, factors affecting, 381, Mich. 560.
economical, production, Miss. 528.
quality and palatability, effect of sorghum grains, Nebr. 805.
Porphyrins—
and diseases of the blood, 242.
formation by yeast-cells and by enzymes from yeast, 467.
*Porthetria dispar, see* Gypsy moth.
*Portulaca oleracea*, macrosporogenesis and embryology, 604.
*Postharmostomum*—
*commutatum* in intestine of fowls, morphology, 401.
*gallinum*, life cycle, 401, Hawaii 518.
Posts, preservation, Ark. 113.
Potash—
as plant nutrient, bibliography, 744.
fixation in soils, effects of drying, Ohio 448.
in cotton soils, effect, 352.
level, replaceable, of soil, Ky. 455.
manure as carrier, effectiveness, Ky. 455.
Potassium—
deficiency in ammonium- and nitrate-fed tomato plants, 193.
determination of small amounts, 726.
fixation and release on Coastal Plain soils, 30.
fixed, availability to plants, 313.
in bentonite clay, availability for tomato growth, N.J. 597.
in honey, 411.
in plants, role, 174, 598.
Potassium—Continued.
in very small amounts of biological materials, spectrochemical analysis for, 437.
release from nonreplaceable forms in Illinois soils, 167.
salts, absorption by storage plant tissues, 748.
Potato—
bacterial ring rot—
and wilt, eradication method, 208.
in Arkansas, first report, U.S.D.A. 635.
in Kansas, U.S.D.A. 782.
in North Dakota, U.S.D.A. 201.
in Utah, a menacing disease, U.S.D.A. 500, Utah 507.
in Virginia, first report, U.S.D.A. 635.
in Washington State, U.S.D.A. 68.
new problems, Nebr. 783.
studies, N.Dak. 77, U.S.D.A. 77.
beetle, Colorado—
food preferences, 225.
studies, U.S.D.A. 84.
toxicity of nicotine to, 653.
bins, types of air intake for ventilation, N.H. 832.
blackleg, dissemination, role of insects in, 77.
blackleg, identity of *Bacterium* causing, 353.
blight, early, Fla. 634, Hawaii 501.
blight, late—
notes, U.S.D.A. 782.
organism, role of peroxidase in immunity against, 507.
relation to copper content of Long Island soils, 358.
reports on, U.S.D.A. 783.
tuber decay by organism, Me. 344.
brown rot, Fla. 634.
byproducts research, Me. 302.
calico and alfalfa mosaic viruses, relation, 847.
discs, metabolic process under conditions conducive to salt accumulation, 320.
disease resistant varieties in Maryland, 201.
diseases—
control, 507, Fla. 634, Wyo. 502.
due to *Rhizoctonia*, control, Fla. 634.
in Dade County, control, Fla. 635.
in Hastings section of Florida, U.S.D.A. 782.
in Louisiana, new or unusual, U.S.D.A. 635.
in Maine, Me. 344.
new and unusual, committee to coordinate research on, report, 852.
of seed pieces, 590.
studies, N.J. 635, West.Wash. 202.
virus, 205, 346, Wash. 202
virus, prevalence, Wis. 345.

Potato—Continued.
diseases—continued.
virus, transmission by insects, Me. 364.
flea beetle—
biology and control, 652.
in Nebraska, Nebr. 662.
notes, Conn.[New Haven] 517.
foliage, mercury absorpton by, Me. 344.
*Fusarium* dry rot, new problems, Nebr. 783.
*Fusarium* wilt resistance, breeding and variety tests for, 353, Nebr. 783.
insects, dusting and spraying for, N.Mex. 365.
leafhopper, control, Ohio 518.
leafhopper on citrus, whitewash for control, 87.
leafhopper spraying and dusting experiments, 521.
mosaic and leaf roll, effect of temperature, soil, and fertilization, N.H. 783.
nematode, field experiments, 362.
nematodes, 501, Hawaii 501.
nematodes, control in Klamath Basin by irrigation, 782.
psyllid in Nebraska, Nebr. 662.
psyllid yellows, control, Wyo. 501.
psyllids and pysllid yellows in Montana, U.S.D.A. 344.
ring rot, another check on, Colo. 863.
ring rot control, Colo. 209, U.S.D.A. 786.
ring rot in Hastings section of Florida, U.S.D.A. 782.
ring rot in Wisconsin, Wis. 345.
root knot damage, 780.
root rots in Montana, U.S.D.A. 344.
rugose mosaic and leaf roll, physiology of plants infected with, 784.
scab, effect of dry land rotations on, Nebr. 783.
scab, effect of sources of nitrogen on, 353.
scab resistance, breeding and variety tests for, Nebr. 783.
scab resistance, variety tests, Wis. 333.
scab, studies, N.J. 635.
seed, longevity, 767.
sprays and spraying programs, improvement, Wis. 345.
stems, dry rot of, 77.
tissue, introduction of liquids into, 456.
tissue, simulation of cooking by chemical agents, 269.
tuber net necrosis and stem end browning, 208.
tubers, cut surface of, control of bud growth and initiation of roots at, 36.
tubers, respiration, effect of substances produced by fungi, 207.
vines, spray and dust treatments, N.J. 635.
virus Y, suspected variant of, 642.
viruses, Y-group, studies, 352.
yellow dwarf damage to late crops in 1939, Wis. 345.

Potatoes—
anaerobic respiration of tubers, 747.
as feed for laying hens, 386.
ascorbic acid in, effect of storage, Wyo. 562.
average yields per acre in Ohio, Ohio 257.
blackening after cooking, relation to mineral elements, 456.
blackening when cooked, test of varieties, Wis. 333.
breeding, Hawaii 479, Nebr. 760, S.C. 480, Wash. 185.
breeding for *Fusarium* resistance, 353, Nebr. 783.
breeding for scab resistance, Nebr. 783, Wis. 333.
breeding hosts of tobacco flea beetle, 661.
certification work, Wyo. 481.
chemical changes in cooking, Mass. 843.
cooking quality as measured by specific gravity, 767, 768.
cooking quality, relation to mineral nutrition and alterations in light intensity, 767.
cost of growing, harvesting, storing, and selling, Me. 405.
cost of irrigating, and increased yields, Nebr. 835.
crop response in a 3-year fertilized rotation, N.H. 760.
culture and storage, 766.
culture experiments, Fla. 616, Hawaii 479, N.Mex. 48, Tenn. 481, Wyo. 481.
cystoamylase in, variation, 598.
deep fat frying at high altitudes, Wyo. 411.
dormancy studies, Hawaii 479.
fertilizer experiments, Fla. 616, Me. 333, Mo. 185, N.J. 617, S.C. 480, Tenn. 481, Wash. 185, Wyo. 481.
field stands, effects of improper storage, Wash. 185.
for starch, optimum yields in Jones County area, Miss. 688.
healthy and with virus diseases, comparative biochemical description, 784.
in Boston market, consumer preferences for, 693.
Katahdin, resistance of progeny to viroses, 786.
Long Island, cost of production and price margins, 836.
losses from plant diseases, U.S.D.A. 201.
manure experiments with, Ark. 626.
Nebraska, outyielding others at Crystal Springs, Miss. 48.
nutrition and heat endurance studies, Nebr. 760.
origin, 177.
production in Western States, U.S.D.A. 834.
production on Long Island, sources of nitrogen for, 57.
quality, effect of fertilizers and rotative systems, 767.

Potatoes—Continued.
quality, reliability of retail prices as guides to, Ohio 116.
research at Cornell University, 766.
role of aphids as virus vectors on, 507.
root knot damage in, 782.
seed, dips for, and soil treatments, N.J. 635.
seed, internal discoloration and net necrosis, U.S.D.A. 344.
seed, maintaining foundation stocks, Me. 344.
seed-piece decay, Fla. 634.
seed-piece decay, role of insects in, 77.
seed-piece rot due to *Fusarium oxysporum*, 77.
seed-piece vitality, effect of soil moisture and fertilizer placement, N.H. 760.
seed pieces, prevention of damage by seed-corn maggot, U.S.D.A. 225.
seed, roguing service for producers, Me. 333.
seed, strength of mercuric chloride solutions in treating, Me. 344.
seedling, stoloniferous condition in, relation to growth characters, 767.
shallow v. deep planting, effect on yield and on *Rhizoctonia* and unmarketable tubers, Me. 344.
spraying and dusting, and comparison of spray fungicides, Me. 344.
spraying experiments, Mass. 796.
spring-grown, treatments to break dormancy, Mo. 185.
storage, bulk v. box, Me. 333.
studies, Ohio 772.
Triumph, free from sprain, Wis. 345.
Triumph, performance of clonal strains, 766.
urea as source of nitrogen for, 54.
varieties, scab-resistant bud mutant, Wis. 333.
variety tests, Fla. 616, 634, Hawaii 479, Mo. 185, N.J. 617, N.Mex. 48, Nebr. 759, S.C. 460, Tenn. 481, Wash. 185, Wis. 333, Wyo. 481.
vitamin C in, 715.
wireworm injury to, Conn.[New Haven] 652.
yield, effect of fertilizers, S.C. 460.
yield increase by special rotations, Ohio 480.
yields, effect of sources of nitrogen on, 353.
yields on land long in grass, Ohio 480.
Poultry—*see also* Chickens, Chicks, Cockerels, Ducks, Fowls, Hens, *etc.*
and egg industries, economic services provided by government and private agencies, 387.
and egg industries, mercantile exchanges in, 387.
and egg situation in Canada, 386.
and eggs, international trade in, trends, 387.
autopsies, N.H. 823.
Poultry—Continued.
breeding—
for disease resistance in, West. Wash. 236.
for high viability, Del. 95.
for meat and egg production, 388.
in Hungary, improvement, governmental proceedings, 387.
organization and control, 387.
selection, use of short-time trapnesting in, 476.
studies, Fla. 666.
use of stud mating in, N.J. 389.
brooders—
electric, in insulated and noninsulated colony houses, Mass. 828.
electric, inexpensive, Wis. 114.
electric, insulated, in uninsulated poultry houses, adaptation, Nebr. 828.
gas-burning, efficiency, N.H. 805.
calcium and phosphorus metabolism, relation to chemical structure of bone, 811.
cannibalism in, effect of types of fiber and bulk, West.Wash. 236.
cannibalism preventing properties of fiber fraction of oat hulls, 534.
cecal fluke, life cycle, 401.
disease resistance and susceptibility, expression of, 387.
diseases—*see also specific diseases.*
and parasites, treatment and control, 253.
control by veterinarian, 678.
effect of environment, Nebr. 546.
dressed, federal inspection, 387.
effect of thyroxin injections to normal, caponized, and thyroidectomized caponized birds, 610.
egg production, hatchability, and livability of chicks, effect of substituting peanut meal for animal protein, N.C. 389.
energy and gaseous metabolism, investigations in Bureau of Animal Industry, 386.
enterprise, place in Corn Belt farm business, 386.
equipment, Ill. 833.
evisceration and quick freezing in United States, 387.
existence in America before its discovery and conquest, 387.
farming, breeding arrangements for in Netherlands, 387.
farms, profits, factors affecting, 386.
fat requirements, 98.
fat requirements and metabolism, N.J. 671.
fecundity in, behavior of persistency in individual hens, 609.
feed, energy value, 386.
feed, legume silage as, Tenn. 530.
feeding, U.S.D.A. 97.
feeding, improved, in Bulgaria, 386.

Poultry—Continued.
feeding, substitute for dried milk in, Miss. 529.
Health Service in Germany, organization and accomplishments, 387.
helminth parasites, treatment and control, 254.
houses, construction, relation to egg production, Mo. 229.
houses, effect of types, Wyo. 530.
houses, insulation and protective covering for insulating material, N.J. 687.
husbandry, effect of variations in sectional economic maturity, 386.
husbandry, health control measures in, 253.
improvement plan, national, 387, 677.
in Rumania and southeastern Europe, frizzle plumage in, 610.
indoor-hen-battery mortality, 253.
industry, advancing, 387.
industry in Denmark, 387.
industry in Estonia, 387.
industry in Great Britain, women's part in, 387.
industry, papers on, 386.
inherited longevity tendency in, economic significance, N.J. 671.
Iowa, marketing methods and costs, 387.
irradiated yeast for, Wis. 382.
keeping, small-scale, advisory system for, in Germany, 387.
lice control, effectiveness of nicotine, Ky. 518.
litter, controlling moisture in, N.H. 805.
marketing, cooperative, in Ohio, 557.
marketing, cooperative, in United States, economic analysis, 387.
marketing, difficulties faced by cooperatives in, Ohio 835.
meat, market quality, factors affecting, 388.
metabolism, effect of activity on, 811.
mixing rations for, N.J. 671.
neoplastic and neoplasticlike diseases of, Mass. 823.
New Hampshire, rate and efficiency of gain, Hawaii 528
nutrition, progress in, 385.
nutrition, role of manganese in, 386.
operating problems and scientific approach to their solution, 388.
parasites in São Paulo, 400.
parasites, studies, Hawaii 517, P.R.Col. 677.
preparation, freezing, and storage, N.Y.State 701.
Producers' Marketing Associations, services to by Farm Credit Administration, 387.
products, flavor, effect of cod-liver oil and fish meal on, 388.
progeny performance, prediction by production of ancestors and relatives, 327.
protein requirements, N.H. 805.
Poultry—Continued.
protein values of Alaska peas for, Wash. 229.
ration, white corn v. yellow corn in, Miss. 236.
rations, fiber and bulk in, effect on growth and on prevention of feather picking and cannibalism, 386.
rations, role of xanthophylls in, 667.
rearing in Norway, organization and marketing, 387.
Regional Research Laboratory dedication, 44.
Rhode Island Red, genetics of, Mass. 757.
riboflavin requirements and sources, Ohio 529.
statistics, national and international, improvement, 387.
statistics of United States, characteristics, 405.
stud-mating system, merits, N.J. 671.
sulfur feeding unsafe in winter, Wis. 382.
sweetpotato flour as source of carotene, S.C. 529.
transmissible diseases, report of committee on, 678.
vitamin A requirements, 385.
vitamin requirements, 236.
vitamins in breeding rations, Wis. 382.
White Leghorn, development of strain suited to individual cage management, N.J. 671.
White Wyandotte, relation between breed characteristics and poor reproduction in, 181.
young, scientific fattening, 388.
Poverty grass, seed germination, 54.
Powdery mildew—
flora of Pennsylvania, additions to, 203.
of ornamental hosts, U.S.D.A. 360.
Prairie chickens, tree buds as winter food for, Wis. 82.
Prairie dog, control, Kans. 363.
Prairies, bunchgrass, of southeastern Washington, plant succession due to overgrazing in, 169.
*Pratylenchus*—
*musicola* in United States, 780, 782.
*pratensis*, distribution and relation to *Fusarium* wilt of cotton, 780, 782.
*pratensis*, parasite of, 649.
Precipitation—*see also* Rainfall, Snow, *etc.*
and evaporation in New Mexico, N.Mex. 590.
and tree growth in Harney Basin, Oregon, 402.
at Ohio station, tabulations, Ohio 446.
data, published, interpretation, advantages in nonuniform hour of observation, U.S.D.A. 591.
Pregnancy—
diagnosis in mares by colorimetric estimation of oestrogens, 613.
electrolyte and nitrogen metabolism in, 413.

Pregnancy—Continued.
urine extract for treatment of sterility in dairy cattle, 613.
Pressure differences, diurnal, in regions of high pressure, 738.
Price policy, British, and price developments in wartime, U.S.D.A. 120.
Prices—
local market, estimating since 1920, 115.
received by farmers, Ohio 689.
*Proactinomyces* taxonomic notes, 607.
*Prodenia eridania*, *see* Armyworm, southern.
*Profenusa collaris*, notes, N.J. 651.
Progesterone—
action on gonadotropic activity of pituitary, 613.
and oestrogen induction of mating responses in spayed female rat, 331.
and testosterone propionate, relative effects on ovipositor lengthening of female bitterling, 328.
assay technic for, 329.
effect on mouse ovary as influenced by gestation, 45.
Progestin, effect on late pregnancy in rats, 758.
Prolactin—
and oestrone interactions, relation to pigeon crop-gland response, 46.
response of crop sacs of pigeons to, factors in, 478.
sex difference in response of pigeon crop gland to, 46.
*Propionibacterium pentosaceum*, fixation of $CO_2$ by cell suspension, 469.
Proso, outstanding varieties, N.Dak. 49.
*Prospodium*—
genus, monograph, 456.
new species, 636.
*Prosthogonimus macrorchis*, notes, 515.
Protein—
and fat problem in German agricultural-chemical investigation, 603.
concentrates, gross values, Wash. 229.
deficient rations, effect on ovulation, oestrus, and reproduction in dairy heifers, 675.
from various sources, use by laying hens and by poults, Nebr. 805.
intake, effect on energy, and nitrogen metabolism of rats, 807.
nutrition, recent advances in, 382.
plastics from soybean products, 17.
poisoning in feeding of swine 678.
supplements, comparative values in winter rations for stock cattle, Kans. 384.
supplements for pigs on rye pasture, comparison, S.C. 529.
Proteinase in wheat flour, 441.
Proteins—
biological value, determination methods, 530.
denaturation, changes of nitrogen content brought about by, 587.
dietary, and regeneration of serum albumin, 128.
Proteins—Continued.
effect of different percentages in diet of six generations of rats, 703.
sensitization to, animal disease conditions possibly associated with, 686.
storage, with low-caloric diets, 272.
Proteolytic enzymes, activation by metals, Wis. 6.
Prothrombin—
deficiency in obstructive jaundice, control by vitamin K, 424.
levels of bile fistula rats, effect of choleic acid of vitamin K, 572.
plasma, in newborn infant, factors affecting, 424.
*Protoparce*—
*quinquemaculata*, *see* Tobacco worm.
*sexta*, *see* Tomato worm.
Protozoa, chemotheraphy of infections with, 821.
Provitamin A in Oklahoma feeds, Okla. 668.
Prune leaf spot of Italian variety perpetuated in budded stock, 214.
Prunes—
ground, digestibility, Calif. 532.
Italian, harvesting, maturity indices for, 494.
pear thrips affecting, West.Wash. 217.
Pruning club, Hebo, description, 497.
*Prunus* crosses, plant characteristics of second generation progeny, 493.
*Psallus seriatus*, *see* Cotton flea hopper.
*Pseudaonidia paeoniae*, notes, Ala. 519.
Pseuderanthemums and notes on nomenclature, 168.
*Pseudococcus*—
*adonidum*, *see* Mealybug, long-tailed.
*comstocki*, *see* Mealybug, Comstock's.
*maritimus*, Brazilian parasite of, 83.
*Pseudolpidium*, sexuality in, 468.
*Pseudomonas*—
*citri*, *see* Citrus canker.
*fragi*, distribution, 674.
infection in turkeys, 255
*tumefaciens*, active immunity of plants against, 204
*tumefaciens*, pathological changes in host tissue due to, 346.
*Pseudoperonospora*—
species and recorded hosts, U.S.D.A. 344.
spp., nomenclatorial note, 71.
Pseudorabies, *see* Paralysis, infectious bulbar.
Pseudotuberculosis in a blackbird, 685.
*Pseudovalsa*—
and related conidial forms, fungi associated with, 348.
cultural histories, 596.
Psychrometer, motor-ventilated for station use, description, 738.
*Psyllia pyricola*, see Pear psylla.
Public health facilities, increasing in importance, S.Dak. 558.
*Puccinia*—
*coronata avenae*, life history, Ark. 68.
genus, new taxonomy for, 204.

*Puccinia*—Continued.
*graminis*—
flexuous hyphae of, 346.
*tritici*, physiologic races in Italian East Africa, 350.
*tritici*, studies, 41.
unusual telial collection, 785.
variation and hybridization in, 346.
new species, 636.
*Pucciniopsis caricae* leaf blight of papaya, 358.
Puerto Rico—
College Station, report, 718.
Station, notes, 432.
University and College Station, notes, 432.
Pullets—*see also* Fowls *and* Poultry.
blood calcium level in, Wis. 95.
Japanese Shamo Game, egg production, Hawaii, 528.
laying, battery cages v. pen management, N.Mex. 95.
laying, feeding methods, Ky. 528.
laying, increased returns from artificial lighting, Del. 95.
laying ration, carrots, Greenmelk, and dehydrated alfalfa leaf meal, compared, Mich. 98.
livability and egg production cause, effect of previous management, Ohio 529.
mineral metabolism of, 811.
mortality and economic significance, 387.
raising, relative cost in sexed and unsexed groups, Wyo. 530.
response to androgens, 46.
sexual maturity in, use of median age as measure, 475.
White Leghorn, effects of slow, medium, and fast growth in, N.J. 671.
White Leghorn, nutritional requirements, Mo. 229.
Pullorum disease—*see also Salmonella pullorum*.
agglutination blood testing for, Mo. 242.
birds positive to serum plate test for, Gram-positive coccus from, 254.
control, national plan for, 678.
control program, coordinated breeding for in United States, 387.
eradication, Mass. 823, N.H. 823.
in poults threat to growers, Colo. 255.
in turkeys, Mass. 823.
of turkeys, whole blood tests for, 112.
transmission, West.Wash. 253.
value of repeated testing for, 685.
whole blood test, effect of *Salmonella* species on, 254.
Pumpkin—
crop, variations in fruit of, 474.
seed-coat membranes, permeability to gases, 747.
Pumpkins, yields under irrigation, Okla. 190.
Purdue University, notes, 431.
Purple scale—
control with lime-sulfur, Fla. 650.
on Satsuma orange, control, Ala. 794.
studies, U.S.D.A. 84.
Putnam's scale on blueberries, N.J. 651.
*Pyrausta nubilalis*, *see* Corn borer, European.
Pyrenomycetes of Georgia, 40.
Pyrethrum—
as an ascaricide, 396.
as crop for western Washington, West. Wash. 217.
constituents, chemical investigations, U.S.D.A. 84.
improvement, Tenn. 489.
Pyridine, germicidal mercury derivatives of, 243.
Pyridoxin, suggested term for vitamin $B_6$, 713.
Pyruvic acid metabolism in normal and vitamin $B_1$-deficient states, 133.
*Pythium* spp., associated with root rots, 71.
Quackgrass control, Wash. 185, Wyo. 481.
Quail—
bobwhite, studies, Ark. 84.
California, sex and age ratios in survival, 792.
yield of weed crops and waste grain as food for, Wis. 83.
Quinhydrone electrode, salt error, effect of pH on, 456.
Quinones—
synthethis, 15.
synthethis, relation to vitamins $K_1$ and $K_2$, 299.
vitamin K potency, 16.
with vitamin K activity, 15.
Rabbit—
fibroma virus, effect, relation to age of host, 820.
milk, composition, stimulated by lactogenic hormone, Mo. 182.
myxomatosis, infectious, review, 820.
papilloma, chemical studies on active agent of, 820.
tick, parasite of cottontail rabbit, 791.
virus, shope papilloma, relation to cancer causation, 820.
Rabbits—
blood value, breed, age, and sex variations in, 611.
cottontail, parasites of, 791.
cottontail, range within a year, Wis. 83.
feed requirements, 388.
feeding in Germany, 388.
parthenogenetic activation of ova, 182.
Russian, cold blackening in, physiology of, 475.
unilateral castration, effect on spermatogenesis, 183.
yield of weed crops and waste grain as food for, Wis. 83.
Rabies—
cultivation of fixed virus and immunizing properties, 820.

Rabies—Continued.
human, virus distribution and pathology, 820.
papers on, 677.
vaccines, immunizing potency, 820.
virus, in vitro culture, 820.
Raccoon-dogs, toxoplasmosis in, 105.
Raccoons, summer food on Montezuma Marsh, New York, 791.
Radiation—see also Solar radiation.
effect on psychrometric readings, 305.
sky, intensity, simple recorder for, 305.
Radiophosphorus in bean seedlings, absorption and movement, 174.
Radiosonde, short cycle, description, 18.
Radish plants, growth, availability of boron for, effect of pH, N.J. 597.
Radishes—
grown in sand cultures under glass, effects of deficiency of essential elements, 336.
vitamin C in, 715.
*Raillietina* spp. of poultry, intermediate hosts, 255.
Rainfall—*see also* Precipitation.
and discharge records for northern Iowa drainage districts, 256.
and run-off from watersheds, U.S.D.A. 21, 590, 738.
characteristics, relation to soil erosion, U.S.D.A. 20.
conduction by plant stems in tropical rain forest, 304.
distribution for 1939, Conn.[New Haven] 446.
ground, under various crop canopies, measurement, 303.
intensities, Ark. 22.
interception by vegetation, 590.
tabulated data, Ga.Coastal Plain, 589.
unseasonable, and flooded fertile cotton areas, Miss. 740.
Rains, erosive, in Ohio, frequency and seasonal distribution, Ohio 20.
Raisin moth, flight habits and seasonal abundance, 85.
Ram, heavily parasitized, effect of commercial phenothiazine on, 545.
Ram semen, characteristics, effect of method of collection, 178.
Ramie—
fertilizer experiments, Fla. 616.
production tests, Fla. 616.
*Ramularia* blight of parsnips, U.S.D.A. 344.
Rancidity prevention, 268.
Range—
forage utilization, 381.
grasses, *see* Grasses.
mixtures fed alone and with supplements, 232.
pastures, Great Plains, restoring, Colo. 618.
plants, nutritive value, Wash. 229.
plants, poisonous, *see* Plants, poisonous, Livestock poisoning, *and specific plants*.
Range—Continued.
resources of Rich County, Utah 258.
typical sand hill, vegetative survey, Nebr. 186.
vegetation injury from early grazing, Utah 430.
Ranges—
carrying capacity, N.Mex. 95.
depleted mountain, restoring, Colo. 618.
restoration by natural and artificial revegetation, N.Mex. 49.
well-managed, depleted by drought since 1931, Colo. 186.
*Ranunculus*—
new combinations in Arizona, 324.
*oresterus*, new collection of, 324.
Rape mosaic disease prevalent in China, 209.
Raspberries—
breeding, 59, Tenn. 481, Wash. 190, West.Wash. 190, 202.
Cuthbert, profitable in coastal British Columbia under proper treatment, 197.
fertilizer requirements, 197.
frozen, vitamin C in, varietal differences, Wash. 268.
mulching, pruning, and fertilizer tests, Ky. 488.
*resistant* to mosaics and aphids, breeding, West.Wash. 202.
retarding decay in by use of $CO_2$, 495.
soil management for, N.J. 628.
spraying studies, Ky. 488.
Sunrise, new variety, characteristics, N.J. 197.
varieties for freezing storage, 495.
vitamin C in, 715.
Raspberry—
budmoth, morphology, life history, and habits, 222.
crown borer, control, N.J. 651.
fruitworm, studies, U.S.D.A. 84.
Indian Summer red, testing, Ohio 488.
root borer, studies, U.S.D.A. 84.
spur blight, control, N.J. 635.
Rats—*see also* Rodents.
Albany, prolonged vaginal bleeding and fetal resorption in, 47.
control, Kans. 363.
female, effect of antenatal androgens on sexual development, 477.
hypophysectomized, response to highly purified extracts of pregnant mare serum, 758.
myocardial lesions from dietary deficiency, 823.
Norway, blue mutation in and blue-black mosaic, 611.
Rattlesnakes, nomenclature, distribution, and variation, 516.
Raven, northern, life and habits, 514.
Rayon—
fiber, structure, 573.
viscose, stress-strain properties, effect of specimen length, 573.

Real estate—
foreclosed, best methods of servicing and handling, 405.
tax rates, tax deliquency, and total tax collections 1938, Ark. 115.
Red char, salted, vitamin D. potency, 717.
Red mite—
citrus, control by insecticides, U.S.D.A. 83.
European, control, 366, 380, Pa. 367.
notes, Ala. 519.
Red scale—
California—
control by fumigation and insecticides, U.S.D.A. 83.
oil sprays for, increasing effectiveness, 88.
control, toxicants and solids in oil for, 524.
Florida, on camellia, Ala. 519.
Florida, studies, U.S.D.A. 84.
Red spider—
control on greenhouse plants, Mass. 796.
control on sorghum in greenhouse, selenized soil for, 73, 365.
greenhouse, N.J. 651.
on apple, studies, U.S.D.A. 83.
seasonal history on hops, 85.
species affecting fruit trees in irrigated regions, Wash. 217.
studies, U.S.D.A. 84.
tartar emetic sprays for, 652.
Redbud *Cercospora* leaf spot, developmental cycle, 214.
Redtop—
fertilizer experiments, Fla. 616.
nutritive value, 381, 383.
Reed canary grass—
competition as means of control of weeds, Nev. 481.
cultural and fertilizer practices on peat land, Wis. 333.
Reforestation studies, Fla. 625.
Refractive index measurements in qualitative organic microanalysis, 152.
Refrigerated locker plants, development and lay-out, Mich, 126.
Refrigerator, general purpose farm, construction, 115.
*Rehmiellopsis bohemica* needle blight of balsam fir, U.S.D.A. 500.
Relapsing fever—
argasid tick as vector, 107.
*Ornithodorus hermsi* as vector, 244.
spirochetes in *Ornithodorus hermsi*, relation to feeding and molting habits, 228.
Relief—
families, characteristics, 123.
measures relating to raising of farm prices, U.S.D.A. 553.
rural, population, composition and characteristics, S.C. 841.
Rennin, purification, 674.
Research—*see also* Agricultural research.
in agriculture at Missouri Station, Mo. 287.
in New England, appraisal and evaluation, 693.
refuge, Patuxent, flora of, 597.
Respiration—
effects of photoperiod on, Mo. 189.
of barley, effect of cyanide on, 319.
relation to phosphate in barley, 34.
*Reticulitermes flavipes*, notes, N.J. 651.
Reticulo-endothelial system, 243.
Reticulo-endotheliosis in cattle, case of, 247.
*Retithrips syriacus*, biology and ecology, 523.
*Rhabdocnemis obscura*, *see* Sugarcane weevil, New Guinea.
*Rhagoletis*—
*cingulata*, *see* Cherry fruitfly.
*fausta*, *see* Cherry fruitfly, black.
*pomonella*, *see* Apple maggot *and* Blueberry maggot.
*Rhectognathus rufiventris* n.sp. from California, 804.
*Rhipicephalus sanguineus*, *see* Dog tick, brown.
*Rhizobium*—
effect of glycine on, 456.
from legume nodules and laboratory cultures, respiration, 40.
growth factor problem in, 467.
*meliloti* nodule formation, relation to nitrogen-fixing efficiency, 456.
spp., growth rates, effect of temperature, 463.
strains, synthesis of coenzyme R by, 463.
*trifolii*, growth stimulating factors, nature of, 468.
*Rhizoctonia*—
aerial species, hitherto unreported disease of beans due to, Fla. 684.
control with home-made yellow oxide of mercury on bentonite, 73.
damping-off of papaya, 358.
diseases on potatoes, N.J. 635.
infection of potato, effect of dry land rotations on, Nebr. 783.
leaf spot of gardenias, 649.
*solani* inoculated into sterilized soil, survival, 27.
*solani* on strawberries in transit, U.S.D.A. 500.
*solani* on sugar beets, 209.
*tuliparum*, notes, U.S.D.A. 500.
*Rhizopertha dominica*, notes, 654.
*Rhizopus*—
fumaric acid formation by, 467.
*oryzae*, spore germination, early growth, and fermentation, 467.
Rhode Island College, notes, 432.
Rhode Island Station, notes, 432.
Rhodes grass v. Sudan grass for dairy cows, Hawaii 528.
Rhododendron—
midge, N.J. 651.
twig and bud blight, due to *Sporocybe azaleae*, new stages of, 513.

*Rhopalosiphum*—
*prunifoliae, see* Apple grain aphid.
*pseudobrassicae, see* Turnip aphid.
*Rhopobota naevana, see* Fireworm, black-headed.
Rhubarb—
breeding and forcing, West.Wash. 190.
organic acids of, behavior during culture of exised leaves, 584.
vitamin C in, 715.
*Rhyacionia buoliana, see* Pine shoot moth, European.
*Ribes* eradication, chemical and mechanical methods in Western States, U.S.D.A. 82.
Riboflavin—*see also* Lactoflavin.
activity of cacao shell meal, Mass. 813.
as preventive of curled toe paralysis in chicks, Wis. 95.
assay, bacteriological method, Wis. 95.
deficiency—
and lack of nicotinic acid, differentiation of symptoms, 859.
in dogs, production, 531.
in hens, effect on embryonic development in chicks, 390.
in man, 850.
in man, experimental production, 134.
reduction of *d*-amino-acid oxidase in rat tissues, 712.
treatment, 134.
determination, fluorometric and biological method, 445.
determination in natural products, 444.
in dried milk products, determination, 152.
in foods, fluorometric method for determining, 151.
in pinto beans, effect of cooking, 422, N.Mex. 421.
requirement of chickens, and sources, Ohio 529.
review of literature, 421.
Rice—
and byproducts, nutritive value, Ark. 127.
and rice products for fattening lambs, 532.
black kernel and white tip, Tex. 206.
bran, energy value, 382.
chlorophyll mutation in, inheritance and linkage relations, 755.
eater's diet, deficiencies of, 425.
effect of nutrient amendment, and other elements, Ark. 48.
fertilizer experiments, Ark. 48, Calif. 484.
irrigation, water resources for, Ark. 113.
leaf spot, control, by resistant varieties, 641.
polish, energy value, 382.
polished, identification of factor with growth-promoting effect on chicks, 812.
prices by varieties, Ark. 116.
Rice—Continued.
rough, farm storage and marketing, Ark. 116.
seedling blights, Ark. 68.
stem rot, studies, Ark. 68.
stem rot, varietal resistance, irrigation methods, and treatment, 641.
weevil, death-feints of, 227.
weevil in stored grain, fumigation with chloropicrin, 654.
white tip, effects of Mg:Ca ratio and irrigation methods, 641.
wild, botany and history, 597.
winter cover crops for, Ark. 48.
yield and growth, effect of fertilizers, Ark. 48.
*Ricinus communis*, shoot, size of nuclei in, 170.
Rickets—
experimental, in rats, effect of A. T. 10, 571.
in chickens, etiology and treatment, 385.
in fowls, pathology, 400.
production by cereal diet, effect of phytin and of fats, 425, 426.
*Rickettsia diaporica*—
cultivation in tissue culture and in tissues of developing chick embryos, 107.
proposed name, 107.
recovery of three strains from *Dermacentor andersoni*, 108.
Rickettsia, pathogenic, from Gulf coast tick, 820.
Rickettsial—
diseases, relation to boutenneuse fever, 820.
infection in rodents, papers on, 820.
Rickettsioses, infectious agents of, preservation, 395.
River measurement, *see* Stream flow measurements.
*Rivoltasia bifurcata* in fowls, 400.
Roach—
control with sodium fluoride, Miss. 523.
powder, Mass. 725.
Roads of different types, mileage, Me. 405.
Rocky Mountain spotted fever tick, rickettsia-like agent from, causing infection in man, 107.
Rodents—*see also* Mice *and* Rats.
control, 517, Conn.[New Haven] 651, Kans. 363.
control in orchard and vegetable garden, 523.
control in orchards and in cold storage, 518.
under field and village conditions, prevalence and control, Fla. 651.
*Rodolia cardinalis, see* Vedalia.
Roentgen rays, *see* X-ray.
*Romalea microptera, see* Grasshopper, eastern lubber.
*Romaniella caesulosius* n.g. and n.sp., description, 804.

Root knot nematode—
additions to list of hosts of, 782.
attacking stems and leaves of plants, 780, 782.
control and active migration, Ga.Coastal Plain 635.
control by chemical treatment of soil, 780, 782.
control on vegetable crops, Fla. 634.
decrease of tomato wilt resistance by, 788.
diseases in Virginia, development, 780, 782.
effect of crop rotation on control, 780.
host specialization in, Tenn. 501.
in *Nicotiana*, resistance to, 780, 782.
in the U. S. S. R., 862.
infestation, analysis of plants reported resistant or tolerant toward, 780, 782.
on tomato and cotton, 782.
Root nodules, *see* Nodule bacteria.
Root pathology and development, miniature observation box for microscopic study, 205.
Root tips, handling in paraffin method, card mounts for, 465.
Roots, upward movement of salt in, 456.
Rose—
bushes, young, importance of soil pore space to, N.Y.State 194.
chafers, trapping, results, Conn.[New Haven] 652.
disease, Arkansas, report, 360.
diseases, control, Ark. 68.
diseases, control by increased spraying efficiency, 360.
diseases, notes, Tex. 81.
hips, vitamin C in, 715.
leaf beetle in Pennsylvania, classification, morphology, life history, and habits, Pa. 375.
plants, defoliation with ethylene gas, 64.
stem and graft canker organism on leaves, 360.
stem girdler, control, 226.
Roses—
Better Times, production of flowers, effect of different soil media, 778.
greenhouse culture, depth of media of various kinds, N.J. 632.
greenhouse, effect of additions of trace elements to solutions, 778.
growth, physical factors of root media affecting, N.J. 632.
mineral nutrition, N.J. 631.
subirrigation method of supplying nutrients to, N.J. 631.
varieties and culture, Ark. 57.
Rotation of crops, Fla. 616, Mo. 159, N.Mex. 49, Nebr. 760, S.C. 481, Tenn. 481, Wash. 185, Wyo. 481.
for erodible soils, review of literature, U.S.D.A. 760.
in soil conservation, Ark. 22.
Rotenoid, definition of term, 363.
Rotenone in solution, effect of the solvent, West.Wash. 217.
*Rotylenchulus reniformis*—
host plants of, 649.
n.g. and n.sp. from cowpea roots, taxonomy and life history, 649.
Roughage as sole ration for lactating cows, Mo. 238.
Roughages, green, moisture determination in, Ohio 535.
Rubber-bearing plant, nematode disease, 362.
Rubber, para, tree, breeding progress with Pilmoor crosses, 634.
Rubber tires—
on tractors, performance characteristics Nebr. 828.
v. steel for farm vehicles, 256.
*Rubus* aphids in Great Britain, biology, 798.
Rue, Syrian or African, poisonous in Southwest, 396.
Rum—
aroma, natural, P.R.Col. 581.
manufacture, Birectifier in, P.R.Col. 581.
types modified through variations in fermentation technic, P.R.Col. 581.
Rumen—
contents, nutritive value for chickens, 386.
digestion studies, 382.
Ruminants—
and nematode problem, view of, 246.
digestibility studies, 383.
respiratory and fermentation gases, Mo. 238.
Run-off—
and erosion from different soil types, S.C. 448.
and erosion from New Hampshire upland soils, determination, N.H. 742.
of Humboldt River, forecasting, Nev. 446.
Rural—*see also* Community.
community organization, textbook, 842.
credit, *see* Agricultural credit.
culture, role of folk schools in, 410.
housing, floor finishes and cost reduction in, Ark. 113.
labor, *see* Agricultural labor.
life, forces influencing, Pa. 841.
living, improvement, U.S.D.A. 698.
regions of the United States, 689.
rehabilitation and relief, suggestions for natonal program, 115.
rehabilitation progress in Stearns County, Minnesota, U.S.D.A. 690.
schools, *see* School.
sociological research, cooperative, 840.
youth in selected areas of North Dakota, problems, N.Dak. 842.
youth of Minnesota, migration, 558.
youth, out-of-school, enter farming, Pa. 124.
Rust—*see also* Cereal rusts *and specific hosts*.
fungi, flexuous hyphae of, 346.
fungi of Alaska, 349.
fungus, physiologic races, host selection by, 503.

Rust—Continued.
species, new, of Minas Geraes, Brazil, 636.
Rusts, tropical, descriptions, 204.
Rutabagas, *see* Swedes.
Rye—
anthracnose in West Virginia, U.S.D.A. 783.
breeding, Wash. 185.
culture experiments, Tenn. 481.
flour, energy value, 382.
for turkeys, value, Wyo. 530.
losses from plant diseases, U.S.D.A. 201.
outstanding varieties, N.Dak. 49.
soybeans as green manure v. sodium nitrate as top dressing for, N.J. 618
stillage, feeding value for dairy cows, 675.
straw, whole and cut, as bedding material, absorptive capacity, 535.
v. bluegrass pasture for breeding ewes, Ky. 528.
variety tests, Ark. 48, Ga.Coastal Plain 617, Tenn. 481, Wash. 185.
vitamin $B_1$ and plant hormones for, N.Y.State 188.
wild, and wheat hybrid grass, claims regarding, without foundation, Colo. 863.
wild varieties, processing seed of, U.S.D.A. 618.
Ryegrass as cover crop, tests, Del. 48.
Ryegrasses, characteristics, merits, and uses, U.S.D.A. 764.
Sacahuiste buds and blooms, poisonous to livestock, Tex. 544.
*Saccharomyces*—
*cerevisiae*, minerals in, spectroscopic analysis, 726.
*ellipsoideus*, effects of carcinogenic substances on, 468.
sp., development, 468.
Safflower, outstanding varieties, N.Dak. 49.
Safranine, for staining plant materials, 465.
*Saissetia oleae*, *see* Black scale.
Saliva of hens, studies, 388.
Salmon meal, vitamin D content, effect of methods of preparation and storage, Wash. 229.
*Salmonella*—
*aertrycke*, virulence and immunizing properties, rough and smooth strains, 822.
*ballerup*, new type with Vi-antigen, 395.
*cholerae-suis kunzendorf* strains, from pigs in New South Wales, O antigens of, 397.
diagnosis, serological, 822.
*enteritidis gaertner* in ducks and ducklings, 684.
*enteritidis*, mouse populations infected with, role of inborn resistance factors in, 476.
genus, nomenclature committee report on, 823.
*Salmonella*—Continued.
group, swarming phenomenon in, 822.
*pullorum*—*see also* Pullorum disease.
viability, Mass. 823.
species from domestic animals, antigenic analysis, 822.
strain from camels in Palestine, 685.
*typhimurium binns*, notes, N.C. 401.
*typhimurium*, biological characteristics of types, Ky. 547.
*typhimurium* in ducks and ducklings, 684.
Salometer, use in pickle manufacture, Mich. 17.
Salt—
iodized, stabilizing iodine in, Wis. 126.
taste threshold of humans, 129.
upward movement in plants, 456.
water injury to turf and lawn soils, Wis. 334.
water spray on foliage, effect, Conn. [New Haven] 651.
Salts in soil or spray waters, chemical effect on lead arsenate, 520.
*Salvia*—
*lanceolata*, poisonous to livestock, Wyo. 541.
*splendens*, colchicine-induced variations in, 473.
Sand—
dune area, Dalhart, soil and erosion changes on, 687.
dune control and wind erosion, list of references, U.S.D.A. 549.
hill area, range survey in, Nebr. 760.
hill range land, vegetative composition and grazing capacity, Nebr. 186.
Sands, saturated, permeability of, 453.
Sandy loam, Ruston fine, productivity, Ark. 22.
Sandy soils, infiltration and capillary rise in, 308.
*Sansevieria*, *Fusarium* leaf spot, 514.
*Saperda*—
*calcarata*, *see* Poplar borer.
*candida*, *see* Apple tree borer, roundheaded.
Saprophytes, filtrable, new group of, 456.
Sapwood and sapwood products, blue stain in, control, U.S.D.A. 361.
*Sarcocystis cuniculi* parasite of cottontail rabbit, 791.
Sarcoma—
and leucosis, viruses and related substances producing, characteristics, 820.
and leukemia of fowls, chemical aspects of agents, 820.
chicken, virus, effect, relation to age of host, 820.
Sarcomata, avian, filtrable agents of, and serological experiments, 820.
Sardines, sild, vitamin D potency, 717.
Sauerkraut—
bacteriology, 436.
kitchenette, bacteriology, Wis. 126.

Sauerkraut—Continued.
kitchenette, causes of discoloration and destruction of vitamin on cooking, Wis. 126.
pink color in, development, 156.
quality, reliability of retail prices as guides to, Ohio 116.
Sawdust as bedding material, absorptive capacity, 535.
Sawflies—
studies, Del. 85.
three species attacking guava in Brazil, 228.
Sawfly—
European wheat stem, and parasite, distribution, 228.
gregarious guava, biology, 228.
guava, biology, 228.
guava shoot-boring, biology, 228.
Sawmills, portable—
efficiency of labor in, Ark. 64.
slack stave, operation in cut-over bottom-land hardwoods, Ark. 64.
Scale insects—*see also* Black scale, Purple scale, *and* Red scale.
infection by *Septobasidium*, 821.
on conifers, use of oil sprays for control, 516.
Scale—
male, injurious to olives, 83.
soft, infesting holly on Vancouver Island, 364.
soft, on camellia, Ala. 519.
*Scapteriscus*—
spp., studies, U.S.D.A. 84.
*vicinus*, *see* Changa.
*Scelio calopteni*, notes, S.Dak. 801.
*Schistosoma* spp., hematin in intestines of, 686.
Schizomycetes, species-concept among, bearing of dissociative variation of, 466.
*Schizotrypanum cruzi*, susceptibility of natural vectors to experimental development of, 820.
School—
area, rural, in central South Carolina, income, expenditures, and educational facilities, S.C. 408.
fund, permanent, of the State, origin, growth, investment, etc., S.Dak. 842.
population and school services in open-country school districts, Ark. 115.
Schools, folk, as means of rural culture, 410.
*Sciara ocellaris*, chromosome elimination in germ cells, Tex. 863.
*Scirpus*, genus, delimination of subgenera Baescirpus and Aphylloides, 169.
*Scirtothrips citri*, *see* Citrus thrips.
*Sclerotinia*—
and *Botrytis*, connection of, 468.
*camelliae* n.sp., description, 80.
on cabbage, U.S.D.A. 68.
*sclerotiorum* on calceolaria, U.S.D.A. 782.
*sclerotiorum* pink rot of celery, control, Fla. 634.
*Sclerotinia*—Continued.
spp. on stone fruits, control, West. Wash. 202.
*Sclerotium rolfsii*, host relations and growth and parasitism, Fla. 634.
*Scolopendra*, sp., vector of gapeworm, 401.
Scolytoidea, keys to families, genera, and species, 226.
*Scolytus*—
*multistriatus*, *see* Elm bark beetle, smaller European.
*quadrispinosus*, *see* Hickory bark beetle.
*sulcatus*, vector of Dutch elm disease fungus under controlled conditions, 377.
*Scopella* genus, new taxonomy for, 204.
Scorpion flies, biology and morphology, 524.
*Scorzonera tau-saghyz*, nematode disease of 362.
Scrapie studies, 682, 820.
Screwworm—
outbreaks in territory beyond winter survival, 516.
response to stimulations of tarsal chemoreceptors, 224.
Screwworms, studies, U.S.D.A. 84.
Scurfy scale, control, 218.
*Scymnus flavifrons*, introduced into California, 83.
Sedimentation principles, treatise, 161.
Seed—
and seedlings, causes of failure in various Florida soils, Fla. 634.
introductions, recording, Hawaii 488.
plants of Sedgwick County, Kansas, 168.
propagation of plant material for conservation planting, U.S.D.A. 454.
research, N.Y.State 770.
treatment, studies, Fla. 616.
treatment with growth substances, effect on dormancy, 749.
treatments with talc and root-inducing substances, 749.
Seedbed preparation—
methods, Wyo. 481.
studies, Mo. 256.
Seed-corn maggot—
biology in South Atlantic States, U.S.D.A. 799.
damage to potato seed pieces, prevention, U.S.D.A. 225.
role in dissemination of potato diseases, 77.
Seed-potato maggot, role in dissemination of potato diseases, 77.
Seeds—
and seedings, response to treatment with indoleacetic acid, 318.
buried viable, in series of old field and forest soils, 171.
detection and identification of disease organisms, technics, 82.
disinfection, dry, 511.
fumigation, Fla. 650.
inspection, Ind. 189, Mass. 335, N.J. 189.

Seeds—Continued.
nondormant, effects of treatment with growth substances, 749.
storage, Fla. 616.
used in producing area, percentages of Wisconsin-produced, Wis. 117.
viability as affected by siloing process, 383.
weed, *see* Weed seed.
Seedstock, improved, maintenance, Miss. 185.
Selenium—
chronic toxicity, effect of diet, 141.
compounds, absorption by crop and converter plants, 455.
compounds, toxicity, effect of soil colloids, 166.
cystine and other organic selenium compounds, toxicity, 680.
in *Astragalus bisulcatus* and seleniferous soils, distribution, 748.
in wheat of Saskatchewan, 727.
introduction into plant tissues as toxicant for insects and mites, 654.
low concentrations, effect on growth of grain, 748.
minimum lethal dose for horses, mules, cattle, and swine, 543.
poisoning, 243.
poisoning, effectiveness of arsenic in preventing, 531.
relation to creeper fowl malformations, 475.
relation to sulfur and nitrogen deposition in cereals, 599.
retention and excretion after administration of sodium selenite to rats, 706.
*Selenophoma* on grasses, 641.
Semen—
bovine, fresh and stored, fecundity and other characteristics, 608.
evaluation, methods for, 178.
physiological properties, 178.
Seminal ejaculation, artificial production of, 615.
*Sepsis impunctata*, life history, 525.
*Septobasidium* infection of scale insects by, 821.
*Septoria*—
*bromigena* and *S. donaciae*, transfer to genus *Selenophoma*, 641.
*chrysanthemi* synonymy, 214.
*viciae* of vetch and peas in Oregon, 641.
*Sericea*—
hay, improved quality by early harvesting, Miss. 48.
residual effect on corn yields, Tenn. 481.
Serum albumin, regeneration, efficiency of food proteins in, 128.
Sesbania for green manure, tests, N.Mex. 48.
Settlements—*see also* Land settlement.
isolated in cut-over area of Minnesota, private and public costs, 697.
Sewage—
disposal problems, 102.
treatment, studies, N.J. 687.
Sex control in animals, 615.
Sex hormones, *see* Hormones.
Shark-liver oil, vitamin content, Fla. 666.
Shavings as bedding material, absorptive capacity, 585.
Sheep—*see also* Ewes *and* Lambs.
breeding, effect of adding wheat-germ oil to ration on frequency of twinning, N.H. 805.
breeding for adaptability to local conditions, 178.
chronic copper poisoning in, 826.
crossbred, wool- and mutton-producing qualities, Wyo. 530.
crosses, wild with domestic, 756.
diseases, 397.
external parasites of, U.S.D.A. 84.
Hampshire, genetic history, 179.
inheritance of horns and scurs in, 756.
Karakul, breeding experiments at Beltsville, 96.
Karakul, difference in blood value, correlation with organic constitution, 326.
manganese requirements, Ark. 94.
methods of administering medicine to, N.H. 823.
native, grade Columbia, and purebred Columbia, progeny performance, comparison, Fla. 666.
Navajo, improvement, 326.
nicotinic acid and grass juice factor requirements, 382.
oestrus in, relation to extra-seasonal production of lambs, 179.
parasites—
and parasitic diseases in Canada, 248.
portable dipping vat for control, 650.
studies, Mo. 242.
poisoning, *see* Livestock poisoning, Plants, poisonous, *and specific plants*.
by sacahuiste buds and blooms, Tex. 544.
with lead arsenate on foliage beneath sprayed apple trees, 248.
Rambouillet, clean wool production in, dam-daughter correlation, 178.
range, production in northeastern Nevada, Nev. 118.
range, reproduction in, 179.
range, rotation paddock system of grazing on irrigated meadows, Nev. 481.
range, wool and lamb production, effect of crossbred matings, N.Mex. 95.
record of performance for, 179.
removal of gastrointestinal parasites from, efficacy of crude unconditioned phenothiazine, 397.
soybean lecithin as supplement to hay and barley for, Wyo. 530.
soybean phospholipids for, 381.
toxicity of lead arsenate and lead arsenate spray residues to, 544.
vaccination against *Brucella melitensis*, 822.

Sheep—Continued.
with gastrointestinal nematodes, reinfection, 821.
with no tails, development, S.Dak. 756.
Shellfish preparation, freezing, and storage, N.Y.State 701.
Shelterbelt plantations, insect problem in, 516.
Sherbet, consumer acceptance, effect of serving temperature, Mo. 238.
Shipping, periodicals relating to, U.S.D.A. 834.
Shrimp, vitamin D potency, 717.
Shrub root rot, N.Mex. 69.
Shrubs—
hardy in North America, manual, 497.
injured by cold weather, treatment, Miss. 64.
newly planted, importance of soil pore space to, N.Y.State 194.
of Michigan for bee pasturage, Mich. 93.
ornamental, care of, U.S.D.A. 199.
seed propagation for conservation planting, U.S.D.A. 454.
varietal and propagation tests, Fla. 624.
Silage—
alfalfa, fermentation studies, 675.
corn—
carotene content, 675.
feeding value for lambs, Wyo. 530.
soybean and sorghum-soybean, relative quality and feeding value, S.C. 535.
varietal quality, N.Mex. 760.
weight of, effect of depth of corn in silo, 675.
crimson clover, quality and palatability for cows, Tenn. 535.
crops, yields and relative palatability and nutritive value for beef calves, Ark. 94.
from hay crops, 381
grass—
and legume, phosphoric acid as preserving agent for, 239.
citrus pulp as carrier for molasses in preserving, N.J. 676.
effect on nutritive value of milk, Wis. 95.
phosphoric acid as preservative and other aspects, N.J. 676.
temperatures in, and preservatives necessary, N.J. 687.
v. corn, lateral pressure exerted by, N.J. 687.
worthy of trial, Miss. 805.
in various types of silos, quality and carotene in, Ohio 535.
legume, as feed for poultry, Tenn. 530.
legume-grass—
effect of feeding various lots to dairy cattle, Mich. 536.
moisture, protein, soluble carbohydrate, and carotene in, Mich. 95.
on Ohio farms, 552.
preparation and utilization, Mass. 813.
Silage—Continued.
legume, studies, Tenn. 436.
legumes, grasses, and cereal crops for, Mo. 806.
*Lespedeza sericea*, alfalfa and corn for dairy cows, comparison, 675.
making problems, Minn. 303.
prepared by phosphoric acid and molasses methods, fermentation studies, 100.
role in dairy program, Miss. 528.
Russian thistle, composition, 233.
sorgo, varietal quality, N.Mex. 760.
stack, effect of type of construction on losses and nutritive value, Wash. 238.
stack, worthy of trial, Miss. 805.
sugarcane, digestibility, Fla. 666.
sugarcane, shocked sugarcane, and pasture, comparative value for wintering beef cattle, Fla. 666.
v. alfalfa hay for fattening yearling steers, Tenn. 529.
Silages, corn, red clover, and alfalfa, comparative analyses, Ky. 528.
Silk, artificial, *see* Rayon.
Silkworm, toxicity of nicotine to, 653.
Silos—
and grass silage, N.J. 687.
temporary v. permanent, S.C. 548.
Silverfish, in a new role, 517.
Siphonaptera, new North American, 525.
Siphonaptera, new records for British Columbia, 364.
Sires—*see also* Bulls.
dairy, proving, Wash. 238.
proved, and sons of proved sires, utilization, 608.
proved, nation-wide, D. H. I. A. program, 608.
purebred, improvement of beef cattle herds through use of, Fla. 666.
reliability of average records of daughters, factors in, 43.
sterile or partially sterile, vitamin C for, 674.
*Sitella*, new genus segregated from *Waltheria*, 168.
*Sitophilus*—
*granarius*, *see* Granary weevil.
*oryzae*, *see* Rice weevil.
Skim milk—
as feed for laying hens, 386.
condensed, preparation and preservation, Nebr. 814.
dried, value for young pigs, Ohio 529.
feeding, relation to cataract production in rats, 283.
fresh and frozen plain, superheated, and sweetened condensed, for ice cream, 672.
powder, base exchange treated, characteristics, in ice cream, 672.
value, for pigs, Wyo. 530.
Skin—
lesions in rats, types of, relation to vitamin $B_6$ deficiency, 713.
wounds, experimentally produced, action of vitamin A on, 425.

*Sky radiation intensity, simple recorder for*, 305.
Slugs, studies, U.S.D.A. 84.
*Sminthurus viridis*, vector of gapeworm, 401.
Smut—*see also* Cereal smuts *and specific hosts*.
diseases, effect of sowing depth and moisture and new control method proposed, 638.
diseases in Egypt, control, 350.
Snail, fresh water, new species, life cycle and other aspects, 522.
Snails, studies, U.S.D.A. 84.
Snapdragons—
breeding, Mass. 771
subirrigation method of supplying nutrients to, N.J. 631.
Sneezeweed poisoning, management for prevention, 682.
Snow—
and timber, studies, Nev. 446.
melting, as flood factor in Sierra Nevada, 739.
surveying, Nev. 46, U.S.D.A. 738.
surveys, value in estimating water supply, Utah 304.
Social—
and economic status in a Louisiana hills community, 123.
change in South Dakota, basic trends, S.Dak. 558, 696.
*organization in Arizona's irrigated areas*, 557.
organization of American agricultural village, changes in, 124.
sciences, design of sampling experiments in, 115.
theory and social action, 123.
Society of American Bacteriologists, Missouri Valley Branch, papers, 456.
Society of American Bacteriologists, proceedings of local branches, 752.
Socioagricultural legislation in Latin-American countries, 123.
Socieconomic submergence in a Plains State, 124.
Sociological—
extension, rural, reports, U.S.D.A. 125.
studies in a rural bituminous-coal mining population, Ark. 123.
Sociology of rural life, treatise, 122.
Sod cutter, low-cost, home-made, decription, Wis. 306.
Sod, decomposing old, use of nitrogen as an aid in, Mass. 740.
Sodium—
absorption by corn seedlings, radioactive isotope study, 174.
alginate as stabilizer for ice cream, Mass. 814.
alginate, uses in dairy manufacturing, Wis. 101.
fluoride for roach control, Miss. 523.
in honey, 411.
in very small amounts of biological materials, spectrochemical analysis for, 437.
Sodium—Continued.
nitrate v. green manure for small grains, N.J. 618.
Soil—
acidity—*see also* Lime, Limestone, Liming, *and* Soils, acid.
experiment, rapid soil tests used on, 308.
aggregation, relation to microbial activity, 311.
and moisture conservation, use of crop residue for, 29.
and water conservation problems, solution aided by physics laboratory, Utah 430.
bacteria, activity in, effect of soil treatments, Mo. 159.
bacteria, effect on soil aggregation, 311.
building, use of cornstalks and straw in, Mo. 159.
cohesion, effect of clay, exchangeable bases, and hygroscopic moisture, 307.
conservation—
and humus, N.J. 592.
and white grubs, 516.
*contour farming for*, Iowa 549.
economic effects, in Salt Creek Watershed, Zanesville, Ohio, 554.
role of farm woodlands in, Ohio 497.
work, S.C. 448.
disinfection and fumigation, review of literature, 347.
erosion—*see also* Wind erosion.
accelerated, effect on silting in Morena Reservoir, U.S.D.A. 29.
and related land use conditions, U.S.D.A. 454.
and run-off, Mo. 160.
and run-off from New Hampshire upland soils, determination, N.H. 742.
control, Nebr. 741.
control, factors involved in study, Miss. 548.
*control from agricultural watersheds*, tillage practices for, Wash. 160.
effect of plant cover and cropping practices, Wash. 160.
*effect of rainfall impact on*, Mo. 160.
in Michigan, grasshoppers as factor, 654.
loss of soil by, effect of phosphating, Tenn. 448.
natural, significance, 454.
on Marshall silt loam, Iowa 22.
problems arising from changes in land use, Mass. 741.
relation to rainfall characteristics, U.S.D.A. 20.
sheet, and gullying, nature of and damage done by, U.S.D.A. 549.
studies, Ark. 22.
fauna, bibliography of, 516.

Soil—Continued.
fertility—
determination, quick methods for, Fla. 592.
need of organic matter high in nitrogen, Miss. 452.
studies, Wash. 160.
moisture—
and tillage, studies, Wash. 185.
calculations from capillary tension records, 163.
capillary tube hypothesis of, 307.
conservation, Nebr. 741.
continuous field measurement, electrical resistance method, Mich. 307.
determination at sticky point, 25.
energy relations, determination by centrifugation, 162.
fluctuation under a lawn, 454.
heat conductivity as index, 25.
holding capacity and its determination, 454.
monoliths, method for taking, 448.
nitrogen, effects of cropping systems, Ky. 479.
nutrients, determination, chemical methods for, La. 7.
parent materials, nature of in southern British Columbia, 449.
population, effect of plants, 468.
profile, ingredients in, N.J. 592.
profile, lateritic, from Puerto Rico, nature of laterization, P.R.Col. 593.
profile, soil constituents and water movement in, N.J. 592.
reaction, determination, comparison of methods, 299.
samples, natural and homoionic, properties, 453.
selenized, for aphid control on sorghum in greenhouse, 365.
separates, mineralogical subdivision by heavy liquid specific gravity separations, 161.
structure, attempts at quantitative characterization, 161.
structure, measurement, Mo. 159.
survey in—
Iowa, Cerro Gordo Co., U.S.D.A. 160.
Iowa, Davis Co., U.S.D.A. 593.
Iowa, Osceola Co., U.S.D.A. 593.
New York, Cattaraugus Co., U.S.D.A. 448.
New York, Otsego Co., U.S.D.A. 306.
North Carolina, Stokes Co., U.S.D.A. 306.
Ohio, Scioto Co., U.S.D.A. 160.
Oklahoma, Major Co., U.S.D.A. 306.
Saskatchewan, use of Brunton compass for, 449.
Virginia, Albemarle Co., U.S.D.A. 306.
survey, progress of, Ohio 448.
Soil—Continued.
surveys, relation to land classification in Alberta, 449.
testing, operation, interpretation, and application, Pa. 742.
testing technic, rapid, standardization, 448.
tests, Me. 309, N.J. 592.
tests, rapid, relation to crop yields in United States, 742.
treatments, effect on bacterial activity in, Mo. 159.
water, *see* Soil moisture.
Soils—
acid—*see also* Soil acidity.
exchangeable-base level, primary minerals of silt fraction as contributors to, 308.
alkali, *see* Alkali.
alluvial, source and nature of erosional damage on, Mass. 741.
amphoteric points, pH, and Donnan equilibrium, 23.
and fertilizers, Tenn. 448.
base-exchange complex, effect of alternate drying and wetting, 166.
base exchange in, 24, N.J. 592.
base-exchange properties, determination, triethanolamine acetate-barium hydroxide buffer for, 300.
biological activity in Sanborn Field after fifty years of treatment, 164.
boron behavior in, U.S.D.A. 314.
brown loam, response to winter legumes, Miss. 479.
buckshot, cultural methods for, Miss. 185.
calcium in, relation to acidity, Mo. 159.
composition, effect of green manure, Fla. 592.
composition, effect of organic matter on, N.J. 592.
Dayton, of Oregon, iron-manganese concretions in, 451.
dry, of great soil groups, thermal conductivity, 162.
effect of arsenious oxide, arsenic oxide, and antimony oxide, Mass. 740.
effect of cryolite, S.C. 518.
eroded, rebuilding, Ohio 448.
erodible, review of literature pertinent to crop rotations, U.S.D.A. 760.
greenhouse, fertility studies, Wash. 160.
heavy, physical properties, effects of cropping and manure, 163.
infertile, relation to barium, 166.
infiltration capacity, measuring, North Fork infiltrometer for, 497.
iodine determination in, 300.
lake, available plant nutrients in, Mich. 449.
lime requirements, determination, buffer for, 300.
loess pampaneo, consistency and physicochemical data, 453.
magnesium in, quantitative determination, 300.

Soils—Continued.
management and fertilization, Mo. 159.
mechanical analysis, chaino-hydrometer for, 306.
microbiological action in and cropping systems, interrelations, Fla. 592.
mineral composition, Fla. 699.
minor elements in, occurrence and behavior, Fla. 592.
muck, *see* Muck.
neutral salt effect and amphoteric points, 23.
nitrogen content, *see* Nitrogen.
of Brazil, studies, 22.
of central Florida, distribution of macro and micro elements in, Fla. 450.
of Florida citrus groves, chemical studies, Fla. 309.
of Florida, classification and mapping, Fla. 592.
of Hawaii, organic base-exchange properties, Hawaii, 448.
of humid and arid areas, chemical comparison, P.R.Col. 593.
of Iowa, plant-food content and lime requirements, Iowa 22.
of Mississippi, additional fertilizer nitrogen requirement, Miss. 455.
of Morrow plats, changes in during long-continued cropping, 163.
of Morrow plats, microbiological aspects 164.
of Palestine, 449.
of Saskatchewan, index rating, 449.
of Texas, composition, Tex. 22.
of Texas, iodine content, 450.
Okanagan, boron in, 451.
orchard, accumulations of arsenical sprays in, Wash. 160.
organic matter in, *see* Organic matter.
oxidation-reduction potentials, relation to soil characteristics and plant growth, 163.
Palouse, leaching of plant nutrients through, effect of cropping systems, Wash. 160.
pasteurizing, new electric devices for, [N.Y.]Cornell 832.
peat, *see* Peat.
permeability to water, Nebr. 741.
pH of, effect of exchangeable ions and neutral salts, 24.
pH of, factors affecting, 453.
physical characteristics, 306.
physical characteristics, relation to earth structures, 452.
physicochemical properties, relation to vegetation, Mass. 741.
Piedmont, in South Carolina, deposits of organic matter under 20 ft. of soil, U.S.D.A. 593.
Podzol, of Massachusetts, Mass. 741.
pore-size distribution in, determination, 452.
range and cultivated, *Azotobacter* distribution and activity in, Ariz. 164.
Soils—Continued.
saturated, permeability of, 453.
selenized for aphids and red spiders on sorghum in greenhouse, 73.
single-base, heat of wetting values, 306.
slick spots in, studies, 31.
sterilized, survival of micro-organisms inoculated into, 27.
structure and pore space in, revised method for microscopic examination, 307.
studies, Fla. 592, N.J. 617.
surface, sampler for, 23.
water percolation in, mean effective pore size and clay migration during, 162.
wet, aeration and plant growth in, 316.
wind-blown, physical and chemical properties, Mass. 741.
Sol concentration, effect on flocculation values, 7.
Solanaceae, susceptibility to big bud disease, 784.
*Solanum*—
spp., crossability, effect on chromosome doubling on, 755.
virus 2, suspected variant of, 642.
Solar radiation—
relation to biophysics and problem of climate and health, 739.
variations in, relation to weather, 447.
Soldier bug, spined, notes, 799.
*Solenopsis geminata*, *see* Fire ant.
Soremouth of sheep, vaccination for, Wyo. 541.
Sorghum—
adjusting corn planters and listers for, Nebr. 550.
breeding, Nebr. 759.
characteristics, relation to industrial utilization, Iowa 6.
culture and use for forage, U.S.D.A. 485.
D Rs P linkage group in, 42.
fertilizer experiments, Fla. 616.
fodder v. native wild hay as roughage for colts, Nebr. 805.
germination of treated and untreated lots, field studies for comparing, Iowa 68.
grain as corn substitute in ration of milking cows, Nebr. 814.
grain, field feeding to turkeys, Nebr. 805.
grain, outstanding varieties, N.Dak. 49.
grain, silage, and fodder as feeds for lambs, Nebr. 805.
grain v. corn for fattening cattle, Nebr. 805.
grain, variety tests, Ark. 48, Ga.Coastal Plain 817, N.Mex. 48, Nebr. 759, S.C. 480, Wash. 185, Wyo. 481.
grain, yields of varietal leaders, N.Mex. 760.
hybrids, inheritance of chinch bug resistance in, 220.
improvement, Colo. 754.

Sorghum—Continued.
Napier grass, corn, and sugarcane, ensiled, comparison of loss of nutrients, Fla. 666.
planting tests, Nebr. 760.
production in Nebraska, Nebr. 768.
response to fallow and other tillage practices, Nebr. 760.
varieties, tall growing best for silage, Miss. 479.
Sorgo—
alfalfa, and soybeans, comparative forage yields, Nebr. 760.
Atlas, cost of irrigating, and increased yields, Nebr. 835.
fertilizer experiments, Tenn. 481.
merits as emergency forage crop, N.Dak. 481.
outstanding varieties, N.Dak. 49.
sirup, composition and quality, factors affecting, 583.
sirup, studies, Tenn. 436.
varieties, Ga. 189.
variety tests, Ark. 48, Ga.Coastal Plain 617, N.Mex. 48, Nebr. 759, S.C. 480 Tenn. 481, Wyo. 481.
yields of varietal leaders, N.Mex. 760.
South Carolina Station, report, 574.
South Dakota College, notes, 575.
South Dakota Station, notes, 575.
Sows, brood—*see also* Pigs *and* Swine.
and their litters, management, Fla. 666. Ga.Coastal Plain 666.
nutritive requirements, Mo. 229.
Soybean—
amylase concentration and characterization, 583.
diseases, virus, 784.
flour and bee bread as pollen substitutes for bees, 378.
flour as pollen supplement to increase honey yield, Wis. 364.
lecithin, as supplement to hay and barley for sheep, Wyo. 530.
meal as grass fertilizer, value, Ohio 480.
meal, constituents, solubility in alcohol-water solutions, 443.
meal, solvent-extracted, proteins, biological value, 530.
nodules, ether extracts of, coleoptile assay, 172.
oil meal, extraction of phospholipoids from, Del. 6.
oil meal for lambs, Pa. 809.
oil meal rations for chicks, animal proteins as supplements, Wis. 95.
oil meal v. cottonseed meal as protein supplements for milking cows, Hawaii 528.
oil meal v. roasted soybeans v. fish meal as protein supplements for swine, Hawaii 528.
plants, yellowing and dying of leaves in, relation to day length, 603.
proteins, effect of different heat treatments on availability or digestibility, Wis. 126.
Soybean—Continued.
proteins, plastics from, 17.
root temperature effects in nutrient solution, Mass. 745.
seedling stem blight, 209.
Soybeans—
advisability of extensive introduction, Utah 334.
alfalfa, and sorgo, comparative forage yields, Nebr. 760.
Biloxi, floral initiation, effect of age and position of leaf receiving photoperiodic treatment, 746.
Biloxi, growth responses to variations of N and P in nutrient solution, 174.
breeding, Ga.Coastal Plain 617, Mo. 185, Tenn. 481.
combined, lower wheat yields following, Ohio 480.
conservation of nutrients as silage and as hay, Vt. 667.
culture experiments, Fla. 616, Ga. Coastal Plain 617, Tenn. 481.
edible varieties, cooking tests, Miss. 562.
fertilizer experiments, S.C. 480.
green and mature, carotene in, 130.
high yields, early planting essential to, Miss. 479.
late varieties, higher yields from, Ohio 480.
photoperiodic responses of varieties, 457.
placement of dolomite, superphosphate, and basic slag for, 761.
planting methods and rates, Ark. 768.
planting tests, Nebr. 760.
roasted, v. fish meal v. soybean oil meal as protein supplements for swine, Hawaii 528.
small response to fertilizers, Ohio 480.
unprofitable on irrigated farms, Colo. 189.
*varieties for hay and grain, R.I. 334.*
varieties, oil contents, Ark. 48.
variety tests, Ark. 48, Colo. 189, Fla. 616, Ga.Coastal Plain 617, Mo. 185, N.J. 617, N.Mex. 48, Nebr. 759, P.R. Col. 617, S.C. 480, Tenn. 481, Wash. 185, West.Wash. 185, Wyo. 481.
vitamin A and vitamin $B_1$ in, 531.
Sparrow, English—
economic status in United States, U.S. D.A. 792.
effect of theelin administration on reproductive system, 478.
gonad-hypophyseal relations and cyclic osseous changes, 44.
*Spartina*, cytotaxonomic studies, 472.
Speciation—
and geographical distribution, relation of genetics to, 753.
from genetic point of view, 753.
Specimen-envelope folder, description, 176.
Spectrograph, role in analysis of agricultural materials, 437.
Sperm middle-piece, presence in fertilized egg of mouse, 758.

Spermatogenesis—
effect of unilateral castration, 183.
in rats, 330.
Spermatozoa—
of dairy bulls, morphological variations in, 608.
of dairy bulls, storage, 608.
preservation, 178.
*Sphaeridium scarabaeoides*, life history, 526.
*Sphaerognomonia*, new taxonomy, 40.
*Sphaerophragmium* new species, 636.
*Sphaeropsis*—
dieback and needle blights of pines, new information on, 215.
*ellisii* on conifers, N.J. 635.
induced witches' broom of oleander, Fla. 634.
Spider beetle, white marked, notes, 363.
Spider, black widow—
effects of ingestion with canned food, 665.
egg parasite, life history, 665.
unusual infestation of a ship with, 228.
Spider lily, seed of, 606.
Spider mite, *see* Red spider.
Spiders—
associated with sweet corn, 804.
red, *see* Red spider.
*Spilonota ocellana*, *see* Budmoth, eye-spotted.
Spinach—
downy mildew, U.S.D.A. 344, 500.
manure experiments with, Ark. 626.
preservation by canning and freezing, Mass. 843.
production on Long Island, sources of nitrogen for, 57.
response to length of day, effect of sodium nitrate, 338.
*Spirochaeta cytophaga*, changes produced in bleached cotton duck by, U.S.D.A. 428.
*Sporocybe azaleae*, new stages of, 513.
Spotted fever—
relation to ticks, 541.
tick, hereditary survival of *Anaplasma marginale* in eggs or larvae, 395.
tick-transmitted, discussion, N.J. 228.
Spotted-wilt virus and pineapple yellow-spot virus, identity, 205, 213.
Spray—
deposits, chemical evaluation, field method, U.S.D.A. 216.
fluids, wetting and spreading properties, evaluation, 793.
materials, foliage and fruit injury from, 509.
mixtures, standard, stickers for, Conn. [New Haven] 652.
program, nonwash, essentials and nonessentials in, 518.
programs, emergency, 522.
residue tolerances, bibliography of, 219.
residues and their removal, Mass. 796, U.S.D.A. 84, Wash. 190.
Spray—Continued.
residues, copper in, determination in small amounts, 584.
residues in Yakima Valley, removal, 795.
Sprayers—
portable, operating costs, Ohio 835.
spraying, spray schedules for azalea and camellia, Ala. 519.
Sprays—*see also* Fungicides, Insecticides, *and specific forms*.
and dusts for florists and gardeners, U.S.D.A. 511.
copper, *see* Copper.
dinitro and related types, experiments with, 218.
dormant, tests, Wash. 217.
early spring, 219.
for codling moth control, Wash. 217.
impact and movement of individual drops upon a surface, photographic apparatus for study, 86.
in potato insect control, 521.
injury to tree and fruit from, 367, 795, Wash. 190.
oil, *see* Oil sprays.
studies, Mass. 796.
use in orchard test plats, 523.
Spruce—
black, role of forest fires in reproduction, 633.
budworm in Minnesota, Minn. 657.
Norway and white, survival of planted trees, N.H. 779.
Norway, cuttings, rooting, effect of growth-promoting substances, 199.
Norway, vegetative propagation, 499.
sawfly, European, studies, 218, 516, N.H. 796, U.S.D.A. 84.
type, southern Appalachian, plantation success, relation to vegetative competition, 66.
Spurge, leafy, control, Wis. 333.
Squash bug—
control by calcium cyanide, 655.
parasitism by *Trichopoda pennipes*, effect on reproduction, 373.
Squash insects, control, Conn. [New Haven] 652.
Squash vine borer, control, Mass. 796.
Squashes—
studies, P.R.Col. 625.
winter, in storage, causes and control of decay in, Mass. 783.
yields under irrigation, Okla. 190.
Squirrel—
Piute ground, life history notes, 514.
red, life history, in New York, 514.
Squirreltail, processing seed of, U.S.D.A. 618.
Staining—
plant materials, chlorazol black E as aceto-carmine auxiliary stain, 465.
plant materials, Delafield's hematoxylin and safranin for, 465.
use of Feulgen nuclear stain and effect of fixatives, 465.

Stallion—
laws in other States, Ind. 670.
semen, studies, 178.
Stallions—
enrollment in Indiana, Ind. 670.
feeding and care, Miss. 97.
sperm production, effects of feed on, 178.
Standards of living in six Virginia counties, U.S.D.A. 408.
Staphylococci of bovine origin, studies, 100.
Starch—
degradation by enzyme, characterization of products, Iowa 6.
elasticity and viscosity as characteristics, Iowa 6.
electrodialyzer for, requirements, 150.
from potatoes, production, Me. 302.
iodine complexes, absorption spectra, Iowa 6
pastes, rigidity of, 150.
wheat, amylopectin and amylose content, 9.
Starlings—
family life and behaviors, 216.
spring development of gonads, 44.
Starters—
of high quality, essential steps in making, 103.
preparation and care, 103.
slow, problem of, 241.
Steers—*see also* Cattle, beef.
beef, fattening, test of various rations, Wyo. 530.
fattening—
alfalfa hay v. alfalfa-molasses silage as roughage, 381.
cottonseed meal and hulls v. corn and lespedeza hay for, S.C. 529.
effect of decreasing corn and increasing hay in rations, Ohio 529.
experiments, Fla. 666, Ga.Coastal Plain 666.
tests of various rations, Ky. 528.
2-year-olds on pasture, feed requirements, Tenn. 529.
use of cracked cull peas in combination with cereal grains, Wash. 229.
use of limited grain ration for, Mo. 229.
feeding experiment in Rice Belt, 234.
grazing tests of summer and winter pastures, Ga.Coastal Plain 666.
Hereford, of selected blood lines, rate and economy of gain, Wyo. 530.
on pasture, feeding concentrates to, 381.
shorthorn, plane of nutrition and digestibility of hay-oil cake ration, 383.
stocker, wintering, rye pasture v. sorghum silage for, S.C. 529.
yearling, fattening, blackstrap molasses in rations, Mo. 229.
*Stemphylium*, pathogenicity and taxonomy, Fla. 634.
*Stenoma mistrella*, studies, 799.
*Stephanitis pyrioides*, notes, Ala. 519.
*Stereum gausapatum*, carbon and nitrogen metabolism, 686.
Sterility—
in corn in Argentina, 471.
in dairy cattle, treatment with pregnancy urine extract, 613.
in ewes, treatment, Wis. 42.
Stinkbug—
predaceous, notes, 517.
southern green, Fla. 650.
*Stipa* new species, 597.
Stock, *see* Livestock.
Stock foods, *see* Feeding stuffs.
Stomach worm—
in sheep, anthelmintics for, 678, 682.
in sheep, factors affecting infestation, 826.
red, experimental infection of swine with, 398.
Storage facilities for personal belongings in home management house, 862.
Storm damage in Vermont and forest tent caterpillar, 218.
Stoves, gasoline, top burners and ovens of, efficiency, Nebr. 862.
Straw and cornstalks, use in soil building, Mo. 159.
Strawberries—
Blakemore, mulching, Ark. 56.
breeding, 59, Ark. 56, N.J. 628, Wash. 190, West.Wash. 190.
culture, N.H. 771.
fertilizer applications and plant development, 197.
fertilizers for, Ark. 56.
fruit bud formation in, Mass. 771.
in transit, *Botrytis* sp. on, U.S.D.A. 500.
in transit, *Rhizoctonia solani* on, U.S.D.A. 500.
losses from plant diseases, U.S.D.A. 201
manure experiments with, Ark. 626.
nitrogen and phosphorus fertilization 61.
response to $MgSO_4$, Fla. 625.
retarding decay in by use of $CO_2$, 495.
sex expression, effect of environmental factors on, Ark. 57.
soil reaction requirements, Ark. 57.
value of barnyard manure for, Ark. 56.
varieties, Ga.Coastal Plain 625.
varieties for freezing storage, 495.
varieties, growth standards for, N.J. 628.
vitamin C in, 715.
winter protection for, 340.
yield, effect of spacing plants on, 776.
Strawberry—
aphid, field sampling for comparison of crop infestations, 519.
black root resistance, testing of hybrids and segregates for, Tenn. 501.
crown borer, control, Ky. 518.
diseases, spraying for, Ark. 68.
dwarf, notes, U.S.D.A. 500.
fruitworm on hops, seasonal history, 65.
insects, control, Mo. 217.

Strawberry—Continued.
leaf roller, American, new control measures for, 222.
leaf roller, western, life history and control, 90.
leaf spot, new, 783.
leaf spot resistance, Tenn. 489.
red stele root rot, 201.
root weevil, West.Wash. 217.
weevil, studies, Del. 85, U.S.D.A. 84.
Stream—
and valley sedimentation, accelerated, principles of, U.S.D.A. 741.
flow forecasting on tributaries of upper Mississippi, problems of, 738.
flow measurements, 828.
pollution and water treatment, N.J. 687.
Streptococci—
hemolytic, in raw market milk, 817.
in experimentally infected animals, localization, 822.
of mastitis, examination of milk for, 109.
*Streptococcus*—
*agalactiae* as an entity and definite agent in bovine mastitis, 822.
*agalactiae* in naturally infected milk, germicidal action of antiseptic dyes, Mo. 238.
*cremoris*, variation within pure cultures, 102.
infections in mice, effectiveness in relation to blood concentration of sulfanilamide and related drugs, 822.
*lactis*, serological integrity, 674.
Strip-cropping project, Tenn. 448.
Strongyloid larvae—
bionomics, and epizootology of helminthiases of grazing animals, 821.
pasture infestation by, technic for estimation, 896.
*Strongyloides*—
*agoutii* n.sp., studies, 522.
*papillosus*, efficacy of nonconditioned phenothiazine against, 543.
*ratti*, indirect mode of larval reproduction in, 821.
validity of species, experimental studies, 821.
Strongyloidiasis, proof of internal autoinfection in, 821.
*Strongylus*—
spp., hematin in intestines of, 686.
spp. infestation in Philippine horses, 251.
spp. removal from horses, effectiveness of crude, unconditioned phenothiazine for, 899.
*vulgaris*, studies, 244.
Strontium, fate after intravenous administration to adults, 415.
Substance-B, Nielson's so-called, properties, 746.
*Subulura brumpti* in poultry, life cycle, Hawaii 518.
Sucrose—
C. P. grade, impurities significant for nutrition of excised tomato roots in, 321.
synthesis by sugarcane excised leaf blades, 608.
v. dextrose as carbohydrate source for excised tomato roots, 321.
Sudan grass—
arsenic toxicity to, Hawaii 501.
culture experiments, Wash. 185.
development and deterioration of roots, relation to growth under different treatments, Fla. 616.
hay, feeding value for lambs, Wyo. 530.
*Helminthosporium turcicum* in seed and glumes, 504.
hydrocyanic acid in, variation in different areas, Wis. 333.
improvement, Colo. 754.
merits as emergency forage crop, N.Dak. 481.
seed production under Michigan conditions, Mich. 54.
v. Rhodes grass for dairy cows, Hawaii 528.
when safe as feed for livestock? N.Dak. 863.
yields of varietal leaders, N.Mex. 760.
Sugar acids, fermentation by bacteria, 469.
Sugar beet—*see also* Beet(s)
blight control, dusting or spraying for, 209.
blight-resistant strains, tests, 78.
byproducts, feeding value for lambs, Wyo. 530.
curly top and plant ecology, 354.
curly-top epidemiology, studies, 354.
curly-top resistance, inheritance, 354.
diseases, etiology and control, Wash. 202.
downy mildew, effect on size, sucrose percentage, and purity, 354.
heart rot, relation to boron, 507.
leafhopper, *see* Beet leafhopper.
nematodes, notes, 362, 500.
nematodes, varietal resistance to, 354.
root rot, status of disease with list of hosts, 209.
root rots, 354.
seed, annual production, relation to fertilizer, N.Mex. 48.
Sugar beets—
breeding, N.Mex. 48.
composition and carbon assimilation, effect of *Cercospora beticola* on, 641.
culture experiments, Wyo. 481.
dusting and spraying, 78.
fertilizer experiments, N.Mex. 48, Wash. 185, Wyo. 481.
improvement, Colo. 754.
irrigation water requirements, Wyo. 481.
losses from plant diseases, U.S.D.A. 201.
soil structure required for, Ohio. 480.
variety tests, Mo. 185, N.Mex. 48.

Sugar—*see also* Sugars, Dextrose, Lactose, Sucrose, *etc.*
Division, report of chief, U.S.D.A. 693.
mills, financial results of operation, La. 262.
raw, prices, P.R.Col. 689.
Sugarcane—
as fresh forage, shocked fodder, and silage, composition and value, 675.
beetle, studies, Ark. 84.
borer, biological control, P.R.Col. 651.
borer, studies, U.S.D.A. 84.
borer under field and village conditions, prevalence and control, Fla. 651.
breeding, Fla., 616, P.R.Col. 617.
buds, germination experiments, Hawaii 479.
characteristics, related to forms of nitrogen used on, 621.
chlorotic streak disease, relation to intracellular chytrid fungus, 505.
disease resistance tests and seedling selections in 1938 and 1939, 505.
diseases, foreign, 501.
diseases in Hawaii, 501.
effects of minor elements, 485.
excised blades, synthesis of sucrose by, 603.
farms, large, financial results of operation, La. 261.
fertilizer experiments, Fla. 616, P.R.Col. 617.
fertilizer experiments, reducing border effect as source of error, 485.
for sirup, disease-resistant varieties, Miss. 48.
germination, factors affecting, 621.
irrigation and green manuring tests, P.R.Col. 617.
irrigation interval control as aid in lowering production costs, 552.
juice, Kjeldahl digestion of, 301.
Napier grass, corn, and sorghum, ensiled, comparison of loss of nutrients, Fla. 666.
nitrogen application for, proper proportioning and timing, 485.
production on small farms, costs, returns, and physical units involved in La. 259.
quarantine, plantation inspection, and consultation services, 501.
red rot disease, host-parasite relations, 783.
value for forage and other purposes, composition factors affecting, Fla. 616.
variety tests, Fla. 616, P.R.Col. 617.
vegetative organs, morphology, 746.
water requirements, Fla. 616.
weevil, New Guinea, field movement, 525.
Sulfanilamide—
and azo dye derivatives, activity in vivo and in vitro, 821.
Sulfanilamide—Continued.
anti-catalase property of, relation to mechanism of bacteriostatic effect, 822.
mode of action, 821, 822.
solubility, stability, specifications, etc., 686.
therapeutic activity in experimental brucellosis of mice, 244.
Sulfapyridine—
in small animal practice, clinical studies, 396.
mode of action, 822.
Sulfonamide series of drugs, disturbances in pigment metabolism following administration, 822.
Sulfur—
burning in empty greenhouses and in mushroom houses, equipment for, Ohio 833.
compounds, fungistatic and fungicidal action, 72.
dioxide, effect on plants and animals, 456.
flotation, Mass. 725.
forms, tests with cotton, N.Mex. 48.
mixtures, *see* Lime-sulfur.
Sunflowers, planting, fertilizer, and production tests, Mass. 759.
Sunlight, *see* Light.
Sunspot—
frequency for 1749–1938, tables, 158.
periodicity, relation to precipitation, temperature, and crop yields in Canada, 18.
Superphosphates, ammoniated and limed, of low fluorine content, absence of reversion in, 594.
Survey data, memory errors affecting, 834.
Swamp fever, *see* Anemia, equine infectious.
Swayback in lambs—
prevention by adding copper supplements to diet of ewes during gestation, 681.
with affinities to Schilder's encephalitis in man, 681.
Swedes—
dark centers in, borax for prevention, Mass. 725.
improvement, Mass. 771.
vitamin A values, Tenn. 564.
Sweet corn—*see also* Corn.
as cash crop in a dairy farm rotation, N.H. 760.
bacterial wilt, N.J. 635, U.S.D.A. 635.
experimental forecast of incidence, U.S.D.A. 201.
in New York, U.S.D.A. 783.
seasonal development, insect vectors, and host range, 787.
breeding, Fla. 616, Iowa 58, Mass. 771.
breeding, spacing, and fertilization, Me. 335.
damage by Asiatic garden beetle, Conn. [New Haven] 652.
fertilization, Ill. 336.

Sweet corn—Continued.
fertilizer requirements, Hawaii 486, Wis. 335.
freezing, fertilizers for, West.Wash. 190.
fresh and frozen, carotene in, 456.
frozen, industry, N.Y.State 772.
hybrids, new Illinois, Ill. 627.
hybrids, testing, Mass. 771, Nebr. 771.
pericarp, characteristics, relation to toughness, Iowa 6.
response to superphosphate, 57.
spiders and insects associated with, 804.
*staminate and pistillate inflorescences*, development, 192.
variety and canning tests, 192.
variety tests, Ga.Coastal Plain 625, West.Wash. 190.
wilt, severity, and winter temperature indexes, N.J. 645.
wilt tests, N.J. 76.
young and more mature, invasion by *Phytomonas stewartii*, 75.
Sweet peas, testing, N.Mex. 57.
Sweetclover—
as probable host of tobacco streak virus, 354.
breeding, Nebr. 760, Wash. 185.
clipping test and coumarin determination with, Nebr. 760.
disease in cattle, and treatment, Wis 105.
disease-resistant varieties, Ohio 480.
growing in permanent bluegrass pastures, Ohio 480.
hay, nutritive value, Wash. 229.
interspecific hybridization and inheritance of character, Nebr. 760.
new insect pest, U.S.D.A. 84.
planting tests, Nebr. 760.
root rot, *Phytophthora cactorum* as cause, 641.
variety tests, Nebr. 759, Wash. 185.
Sweetpotato—
carbohydrates, effect on determination of carotene, S.C. 439.
diseases, control, Del. 68.
flour as source of carotene for chickens, S.C. 529.
plant production beds, electrically heated, S.C. 548.
pox, effect of soil reaction, N.J. 635.
scurf, mercurial dips for, N.J. 635.
soil rot disease, caused by an *Actinomyces*, 788.
starch, use in baking, 702.
surface rot, U.S.D.A. 344.
weevil, studies, U.S.D.A. 84.
Sweetpotatoes—
as feed for dairy cows, value, Miss. 666.
breeding, Tenn. 481.
date of planting and plant bed experiments, N.Mex. 48.
dehydrated, biochemical and nutritional studies, S.C. 506.
dips for enhancing color and preventing rots, N.J. 635.
Sweetpotatoes—Continued.
fertilizer experiments, Mo. 185, S.C. 480, Tenn. 481.
formulas and carriers of N, P, and K, Ga.Coastal Plain 617.
hogging off, returns from, Ga.Coastal Plain 666.
internal break-down, 788.
*losses from plant diseases*, U.S.D.A. 201.
manure experiments with, Ark. 626.
nitrogen and potassium top dressings for, Ga.Coastal Plain 617.
nutrient absorption as affected by fertilizer placement, Del. 48.
Porto Rico, vitamin A values, Tenn. 564.
production don'ts, Miss. 48.
production in electrically heated hotbeds, S.C. 769.
ratios of organic: nonorganic nitrogen with, Ga.Coastal Plain 617.
storage and slip production, electricity as source of heat for, Tenn. 481.
value of close spacing, Miss. 185.
varieties for starch, Miss. 48.
variety tests, Ga.Coastal Plain 617, Hawaii 479, Mo. 185, P.R.Col. 617, Tenn. 481.
Swine—*see also* Pigs.
cross, hybrid vigor in, 43.
enteritis, papers on, 678.
*erysipelas*—
acute, outbreak, 542.
bacterium in hog cholera virus blood, phenol tolerance of, 249.
isolation of causative organism, Ky. 540.
notes, Wash. 242.
influenza virus, intermediate host between epizootics, 821.
manganese requirements, Ark. 94.
minimum lethal dose of selenium as sodium selenite, 543.
*semen, storage*, 178.
tonsillar tissue, acidfast bacterium in, 398.
Sycamore trees, serious disease threatening, 790.
Sylvatic plague, latent, 823.
*Symphyla*, embryology and affinities, 523.
Symptomatic anthrax. *see* Blackleg.
*Syngamus trachea*—
hematin in intestines of, 666.
new intermediary vectors for, 401.
sex difference in infection rate of birds with, 401.
Synovitis, tuberculous, in bovines resulting from intravenous injection of avian tubercle bacilli, 247.
*Syntermes* [illegible] *n.sp.*, description, 799.
Syphilis, protective antibodies in, 232.
Syrphidae of Minnesota, Minn. 32.
*Taenia*—
*n.sp.* from [illegible], 804.
*pisiformis* parasite of cottontail rabbit, 791.

*Taeniothrips*—
*inconsequens*, *see* Pear thrips.
*simplex*, *see* Gladiolus thrips.
*xanthii*, studies, U.S.D.A. 84.
Tankage v. mixture of tankage and soybean oil meal, for swine, Ky. 528.
Tapeworm—
cysticercoid of, 363.
genus *Hymenolepis*, compendium, Okla. 650.
infestation, effect on condition of sheep, 111.
Tapeworms—
of poultry, intermediate hosts in Kansas, 255.
of poultry, relation to nutrition, Hawaii 517.
of sheep, Wyo. 541.
*Taphrina*—
*dearnessii*, new host for, 648.
group on North American maples, distribution, 648.
*lethifera* on mountain maple, distribution, 648.
*macrophylla* n.sp. on alder, 214.
Taro—
fertilizer experiments, Hawaii 479.
variety tests, Hawaii 479.
*Tarsonemus pallidus*, see Cyclamen mite.
Tartar emetic—
on leaf and fruit surfaces, analysis, using iodine-starch paper, 583.
sprays for red spider, 652.
Tax—
delinquency on farm real estate, S.C. 551.
legislation, graduated land, Oklahoma's experience with, Okla. 689.
revenues in towns in Aroostock County, Me. 405.
trends of Michigan as related to agriculture, Mich. 119.
Taxes, rural property, problems in the State, Ala. 691.
Taxonomy and floristics of the Americas, 596.
Tea scale on camellia, Ala. 519.
Teeth—
mottled enamel, production halted by change in water supply, 141.
pathology of, effects of darkness and controlled radiation, 427
*Telenomus*—
*ichthyurae*, notes, Mo. 798
*ovivorus*, egg parasite of false chinch bug, description, 804.
Telephone facilities on farms, Me. 405.
Temperature—*see also* Climate.
climate of Sweden, 21.
conservatism of equivalent potential and wet-bulb potential, 157.
low, damage to fall grains and legumes, Miss. 19.
low, mechanism of injury and death by, 600.
low, resistance in crop plants, nature of, Nebr. 740.
Temperature—Continued.
subzero, home-made device for maintaining, 363.
wet-bulb potential, distribution in four selected cyclones, 157.
Tenant-landlord relations in Ohio, legal aspects, 406.
*Tenebroides mauritanicus*, intermediate host of chicken cestode, 255.
Tennessee Station, report, 574.
*Tenodera angustipennis*, egg content and nymphal production and emergence in oothecae, 219.
Tent caterpillar—
eastern, insecticides and spreaders for, 367.
forest, and storm damage in Vermont, 218.
forest, ecological aspects in national forests in Minnesota, 515.
forest, studies, 515.
Teosinte, uncontrolled vegetative development in, 37.
Tephritinae of China, key to genera, 224.
*Tephrosia virginiana*, extracts of roots, toxicity tests, 520.
Tergitol 7 penetrant, insecticidal properties for adult Japanese beetle, 527.
Termite, dry-wood, studies, P.R.Col. 651.
Termites—
control, N.J. 651.
control, new developments in, 516.
subterranean, diphenylamine as soil poison against, 523.
Test tube, modified to prevent bumping and promote boiling, 588.
Testosterone—
and oestrogen, tolerance of male and female mice to, 758.
and theelin, comparison of effects on immature female rats, 46.
applied locally to penis of rat, effect, 758.
propionate—
action on female genital tracts, 329.
action on structure of anterior pituitary of female rat, 46.
and progesterone, relative effects on ovipositor lengthening of female bitterling, 328.
propionate, effect on—
black-crowned night heron, 615
development of reproductive ducts in female sparrow hawk, 478.
immature female rat and guinea pig, 476.
ovariectomized rat, 331.
pregnancy and on passage of ova through oviducts, 612.
sexual differentiation in genetic female mice, 329.
thyroid and parathyroid glands of rats, 615.
propionate injections, precocious copulatory activity induced in male rats by, 477.

*Tetranychus*—
sp., notes, Ala. 519.
*telarius*, *see* Red spider.
Tetraploidy, colchicine-induced, in *Lilium*, 598.
Texas Station, notes, 575.
Texas Station publications, abstracts, Tex. 863.
Textile—
fabrics, adequacy of labeling with regard to fiber content, 142.
fibers, newer, identification, 860.
finishing treatments, technical evaluation, flexibility and drape as measurable properties, 860.
materials, capacitance in relation to moisture content, Minn. 427.
research from consumer point of view, progress in, 859.
Textiles—*see also* Fabrics.
consumer specifications for, 286.
household, place in farm budget, Miss. 142.
household, provision and use by farm families, S.C. 574.
testing, physical, chemical, and microscopical, 860.
Thallium toxicity and tobacco frenching, differentiation, 209, 506.
*Thanasimus lecontei* factor in control of western pine beetle, 801.
Theelin—
administration, effect on reproductive system of female English sparrow, 478.
and testosterone, comparison of effects on immature female rats, 46.
*Thelazia californiensis*—
from a mature buck deer in Sequoia National Park, 249.
normally a parasite of herbivorous mammals, 249.
Thelaziasis, ovine, studies, 249.
Thiamin—*see also* Vitamin $B_1$.
administration in vitamin $B_1$ deficiency, fatty livers resulting from, 132.
chemical reagent for, 10.
in urine as index of nutritional level, thiochrome test for, 851, 852.
in urine, chemical determination, stability, and form, 731.
ultramicrodetermination by fermentation method, 444.
ultraviolet absorption spectra and their reduction products, 731.
urinary excretion of, by normal individuals, 853.
*Thielaviopsis basicola*, notes, 780, 781.
Thiol compounds, effect on gonadotropins, 184.
Thistle, Russian—
hay, feeding value for lambs, Wyo. 530.
silage, composition, 233.
Thistles recently introduced into Texas, 753.
*Thompsonella*, genus, history and status, 169.
Thrips—
collecting, modified Berlese funnel for, U.S.D.A. 83.
injurious, distribution in United States, 86.
new species from Mojave Desert, 86.
on stone fruits, control, West.Wash. 202.
*Thrips tabaci*, *see* Onion thrips.
Thurberia weevil, studies, U.S.D.A. 84.
Thyroid—
activity and vitamin $B_1$ requirements, 280.
effect on egg production, Mo. 672.
gland and lactoflavin, relation, 713.
glands of immature rats, effect of testosterone propionate, 615.
Thyrolactin—
assay method, 608.
new source of thyroxine for dairy cattle, 608.
Thyroxine—
effect on yield and composition of milk of dairy cows and goats, Mo. 759.
for dairy cattle, thyrolactin new source of, 608.
injections, effect on physiological processes of dairy cattle, 608.
Thysanoptera of Kauai, host plant list, 220.
*Thysanosoma actinioides*, studies, 249.
*Thysanus*—
*elongatus*, parasite of Comstock's mealybug, 657.
*nigra*, parasite of Comstock's mealybug, 657.
Tick—
argasid, burrowing owl as host, 216.
fever, Colorado, 820.
fever, studies, 820.
fowl, problem of acquired immunity to, 254.
Gulf coast—
in southern Georgia, 94.
pathogenic rickettsia from, 820.
testing repellents of, U.S.D.A. 83.
problem of New Jersey, N.J. 228.
tropical horse, hereditary transmission of anaplasmosis by, 106.
Ticks—*see also* Cattle ticks.
and disease, 541.
eradication in Florida, complicated by tropical variety, 396.
eradication, report of committee on, 678.
filter-passing infectious agent isolated from, 107, 820.
in Arizona bat caves, 528.
in Manchoukuo, studies, 678.
Tierzucht Congress, topics receiving most attention, 178.
Tillage and soil moisture, studies, Wash. 185.
*Tilletia* spp., new races, Wash. 202.
Timber—*see also* Lumber and Wood.
and snow, studies, Nev. 446.
depletion of starch from, relation to attack by *Lyctus* beetles, 527.

Timber—Continued.
farms in upper Ozark region, Ark. 115.
marketing problems in central hardwood region, 201.
Timothy—
alfalfa-clover seedings, mixed, productiveness, Ohio 480.
alfalfa seedings, improvement by use of cultipacker, Wis. 333.
clover hay, fertilizer experiment, N.H. 760.
conservation of nutrients as silage and as hay, Vt. 667.
cultural and fertilizer practices on peat land, Wis. 333.
hay, adequacy in calcium for growth of dairy heifers, 675.
high-protein, production, N.J. 617.
*Timulla*, systematic revision of genus, Minn. 379.
*Tipula* sp., vector of gapeworm, 401.
Tires—
pneumatic tractor, for use of North Dakota farmers, N.Dak. 256.
rubber, for agricultural machinery, Iowa 550.
rubber, for home-made carts and trailers, S.Dak. 403.
Tissues, introduction of liquids into, 456.
*Tlascala finitella*, studies, Mass. 796.
Tobacco—
analyses, Ky. 436.
angular leaf spot in plant beds, Ky. 501.
bacterial leaf spots in Kentucky, U.S.D.A. 500.
black root rot, Mass. 783.
black shank in Burley section of Kentucky, U.S.D.A. 783.
black shank spread by drainage water, Ky. 501.
blackfire, control, Ky. 354.
brown root rot and black root rot, in Canada, prevention, 506.
brown root rot, relation to weather, Wis. 345.
Burley, *Fusarium* wilt-resistant, Ky. 501.
Burley, prices and sales, changes in seasonal movements, Ky. 551.
cigar, fertilizer tests, Wis. 333.
cigar-leaf, harvesting, chemical, and fermentation studies, Conn.[New Haven] 486.
constituents, chemical investigations, U.S.D.A. 84.
curing experiments, Ky. 479.
curing methods, S.C. 481.
curly top virus, passive immunization from, 643.
disease-resistant varieties, Fla. 635.
diseases—
and decays in Connecticut, Conn. [New Haven] 354.
in Canada, 505.
in Kentucky, U.S.D.A. 635.
Tobacco—Continued.
diseases—continued.
losses from, U.S.D.A. 201.
relation to weather, Fla. 634.
virus, 784.
downy mildew control, Conn.[New Haven] 505, Fla. 78, 635, S.C. 501.
downy mildew, control demonstrations, Fla. 634.
downy mildew, control, toxicity of paradichlorobenzene in relation to, 506.
downy mildew in Massachusetts, U.S.D.A. 782.
downy mildew, relation to weather conditions, history, 643.
downy mildew, studies, Ky. 501, U.S.D.A. 500.
effect of various rotations, S.C. 481.
farms, receipts, expenses, farm and labor incomes, etc., P.R.Col. 689.
fertilizer experiments, Ga.Coastal Plain 617, Ky. 479, S.C. 481, Tenn. 481.
fertilizer formulas, Ga.Coastal Plain 617.
fertilizer placement, Ga.Coastal Plain 617.
flea beetle—
control in tobacco plant beds, S.C. 519.
host plants, 661.
migration, 661.
studies, U.S.D.A. 84.
flue-cured, diseases, control, Ga.Coastal Plain 635.
flue-cured, general recommendations for, Ga.Coastal Plain 617.
frenching, distinguished from thallium toxicity, 209, 506.
*Fusarium* wilt resistance, breeding for, Tenn. 501.
growth and level of replaceable potassium, Ky. 479.
growth, in solution cultures, effect of algae, 601.
hornworm control, Tenn. 519.
in principal producing countries of far east, U.S.D.A. 555.
injury from wireworms, control, Ky. 518.
leaf spot diseases, low soil fertility predisposing to, Ky. 501.
leaves, infection by *Bacterium tabacum*, relation to stomata, 77.
mosaic control, Wis. 78.
mosaic, cytological research, 346.
mosaic damage and resistant varieties, Ky. 501.
mosaic dissemination in the field, 210.
mosaic virus—
electro-optical effect in, 346.
formation of plate and needle crystals in cells affected with, 346.
in liquids over 14 years old, infectivity of, 643.
in living cells, reversible inhibition with molar sodium cyanide, 210.
inhibition, Wis. 345.

Tobacco—Continued.
mosaic virus—continued.
movement, relation to food translocation, 642.
new views in, 205.
overwintering in soil under natural conditions, Mass. 783.
protein, break-down of, 345.
*protein, thixotropic character, 346*, 643.
thermal denaturation, 210.
type-1, attempt to propagate in chorioallantoic membrane of chick embryo, 71.
type-1, causing tomato fruit stripe, 644.
new insect pest, N.J. 651.
plant bed fertilization, Fla. 616.
production and consumption in Netherlands Indies, U.S.D.A. 406.
quality following weed fallow, 54.
red rot, U.S.D.A. 500.
root knot in Florida cigar-wrapper fields, control, 780, 782.
rotations for, Tenn. 481.
secondary nutrient elements for, Ga. Coastal Plain 617.
seed, germination after 7 yr. in different types of storage, Fla. 616.
seed production, Ga.Coastal Plain 617.
seedbeds, damping off in, U.S.D.A. 68.
seedbeds, use of paradichlorobenzene in, to control tobacco downy mildew, 506.
shade diseases, Ga.Coastal Plain 635.
soils, relative rate of nitrification of nitrogen materials, Mass. 740.
streak, relation to similar virus disease in sweetclover, Ky. 501.
streak virus, sweetclover as probable host, 354.
thrips, notes, Conn.[New Haven] 517.
*trade with Latin America*, U.S.D.A. *836*.
variety tests, N.Mex. 48, Tenn. 481, Wis. 334.
wildfire relation to stomata, Ky. 501.
wildfire, studies, U.S.D.A. 500.
worm, studies, U.S.D.A. 84.
worm, toxicity of nicotine to, 653.
yield and quality, control of injury from old sod plowed under preceding tobacco, Mass. 759.
yield and quality, effect of soil nitrate level, Ky. 479.
yields on land long in grass, Ohio 480.
Tocopherol—*see also* Vitamin E.
α, preventive effect in nutritional muscular dystrophy, 382.
Tocoquinone, α, vitamin E activity of, 284.
Tomato—
big bud spread in connection with ecological conditions, 784.
blight diseases, spraying for, Wis. 345.
blight, early, effect of rainfall and humidity, Ga.Coastal Plain 635.
blight, spray program against, Miss. 76.
bug, ecology, Hawaii 517.
*curly top, notes*, U.S.D.A. *635*.
Tomato—Continued.
curly top, resistance of Chilean tomatoes to, 78.
disease in Hawaii due to pineapple yellow *spot virus*, 213.
diseases—
control, Fla., 635, Ohio 501.
effect of growing and shipping methods, 788.
in New Jersey, 212.
in northeast Texas, U.S.D.A. 782.
losses from, U.S.D.A. 201.
seasonal occurrence in Florida, Fla. 644.
situation in Utah, U.S.D.A. 782.
fields in Cumberland County, *survey*, N.J. 625.
fruit pox in Arkansas, U.S.D.A. 344.
fruit pox in Texas, 213.
*fruit stripe, caused by tobacco type-1 virus*, 644.
fruitworm—
control, 91, U.S.D.A. 216.
control, effects of alfalfa on abundance, Wash. 217.
poison tests with, S.C. 518.
*response to lights*, Ohio 518.
studies, U.S.D.A. 84.
*Fusarium* wilt—
control, Fla. 634.
*resistance, breeding for*, Tenn. *501*.
resistant varieties, Mo. 78.
industry in Puerto Rico and Cuba, list of references, 834.
juice, ascorbic acid in, effect of refrigeration, 136.
juice, canned, vitamin C in, effect of *presence of iron and tin*, Ark. *126*.
juice, commercially canned, vitamin A in, 416.
juice, home-canned, standardization, Fla. 699.
leaf blight severity in Virginia, U.S.D.A. 783.
*leaf mold disease, control*, Mass. *783*.
leaf roll in District of Kursk and Voronezh, 784.
leaf spot in hotbeds, adequate ventilation as control, Ohio 488.
leaf spot resistance, Tenn. 489.
leaves, rolling of, U.S.D.A. 500.
mosaic, *virus strain of aucuba-type*, 511.
pectin-methoxylase, heat, inactivation, 296.
pinworm, studies, U.S.D.A. 84.
plants, ammonium- and nitrate-fed, potassium deficiency in, 175.
plants, growth status and metabolism, effect of varying amounts of potassium, 174.
plants, nematodes in, 362.
pomace, feeding value, 530.
*roots, effect of zinc deficiency on, 644*.
roots, excised, growth, effect of impurities *of C. P. grade sucrose, 321*.

Tomato—Continued.
roots, excised, sucrose v. dextrose as carbohydrate source for, 321.
seed treatments and sprays, Ga.Coastal Plain 635.
seed, X-ray treatment, white flower character from, 177.
seedling disease, studies, 212.
seedlings, ammonium- and nitrate-fed, potassium deficiency in, 193.
shoots, excised, metabolism of nicotine monohydrochloride in, 321.
streak, 784.
wilt resistance and its decrease by *Heterodera marioni*, 788.
wilt, studies, Mo. 201.
worm, response to lights, Ohio 518.
worm, studies, U.S.D.A. 84.

Tomatoes—
acidity in, factors affecting, Ohio 488.
ascorbic acid in, effect of home canning and subsequent storage, 136.
availability of potassium in bentonite clay for, N.J. 597.
breeding, Ark. 56, Mass. 771, N.J. 625.
breeding and culture, Nebr. 771.
breeding for *Septoria* and early blight control, Wis. 345.
canning commercially, use of calcium in, N.Y.State 302.
canning factory, economic considerations in growing, Ind. 262.
canning, scoring system for, 193.
canning, spraying v. dusting, Ohio 788.
Chilean, resistant to curly top, 78.
culture experiments, Ga.Coastal Plain 625.
disease resistant, breeding and selection, Del. 68.
fertilizer experiments, Ga.Coastal Plain 625, Mo. 190, Pa. 773.
fertilizer placement methods, N.J. 625.
greenhouse-grown, pollination studies, Mich. 490, Mo. 189.
growing on trellises, Mass. 771.
home-canned, standardization, Fla. 699.
improvement, Mass. 771.
improvement through selection of new hybrids, Fla. 625.
induction of parthenocarpic fruiting in, Ark. 56.
irrigation, Ark. 56.
leaf anatomy and starch content, effect of pruning, Ark. 56.
manure experiments with, Ark. 626.
maturation, Fla. 625.
mature-green, ripening and repacking, U.S.D.A. 774.
Mingold, origin and distinguishing characters, 336.
mulching materials for, N.J. 625
N and P nutrition of, Ky. 488.
pectic enzymes of, 296.
phosphoric acid requirements, N.J. 625.
planting date, Me. 335.
production, factors affecting costs, prices, and profits from, N.J. 688.

Tomatoes—Continued.
pruning and staking, Fla. 625.
puffing disorder of, Fla. 634.
quality, reliability of retail prices as guides to, Ohio 116.
resistant to *Septoria* leaf spot, testing, Ark. 56.
response to superphosphate, 57.
Rutgers, yield, factors affecting, N.J. 625.
shape index in, Mass. 771.
shipping conditions, Ga.Coastal Plain 635.
spray residue studies, N.J. 625.
spraying, Fla. 634.
staked, spacing, 193.
starter solutions for, N.Y.State 193.
stem morphogenesis, cell size and number in, 315.
varieties, *Fusarium* wilt isolation from, differences in growth characters and pathogenicity, U.S.D.A. 212.
variety tests, Fla. 625, Ga.Coastal Plain 625, Ky. 488, Mo. 190, N.Mex. 57, Ohio 488, West.Wash. 190.
vitamin C in, 715, Ohio 488, Utah 412.
vitamin C in, relation to acidity, 854.
yields under irrigation, Okla. 190.

Tonsils, vitamin C in, and relation to their protective function, 422.
Toxemia in sheep, Mo. 242.
*Toxocara* spp., hematin in intestines of, 686.
Tractor farming, remodeling used machinery for, S.Dak. 829.

Tractors—
rubber tires on, performance characteristics, Nebr. 828.
tests, Nebr. 114.

Trade—
agreement, Venezuelan, agriculture in, U.S.D.A. 120.
agreements, reciprocal, analysis of terms pertaining to, Okla. 406.
policy, foreign, desirable for American agriculture, 834.

Trailers, rubber tired, home-made, S.Dak. 403.
*Trametes* spp., from region of Great Lakes, 785.
Transpiration stream in leaves of cereals, 599.

Tree—
area ratio and its applications, 632.
buds as winter food for prairie chickens, Wis. 82.
cankers in Iowa, fungi associated with, 348.
diseases, control, Ohio 501.
diseases of shade and ornamental species, U.S.D.A. 343.
diseases, studies, 215.
girdlers, important economic species in United States, 662.
growth, soil factors affecting, 450.
leaves, rate of decomposition relation to acid-base balance and other chemical properties, 25.

Tree—Continued.
losses in mid-west United States during 1933–39, 66.
ring analysis, bibliography, 740.
ring chronology, estimated, of western Pueblo area, 150–1934 A. D., 740.
root rot, N.Mex. 69.
seedlings, distribution for shelterbelt and other uses, Wyo. 489.
Treehoppers, effect of lime-sulfur and of oil sprays on eggs, and emergence, 652.
Trees—
coniferous, *see* Conifers.
drought injury, in Nebraska, U.S.D.A. 500.
evergreen, *see* Evergreens.
forest and fruit, studies, Fla. 625.
forest, growth and survival, relation to ground water level, Wis. 342.
forest, high temperature tolerance, Minn. 65.
forest, of Michigan for bee pasturage, Mich. 93.
growth, and precipitation in Harney Basin, Oregon, 402.
growth as related to soil morphology, [N.Y.]Cornell 497.
hardwood, effective utilization, Ohio 497.
hardwood, growth, effect of root pruning after digging, 498.
hardwood, growth rates, Ark. 65.
hardy in North America, manual, 497.
injury from sulfur dioxide fumes of electric refrigerators, 72.
newly planted, importance of soil pore space to, N.Y.State 194.
on prairie soils, causes of failure, Wis. 342.
ornamental, care of, U.S.D.A. 199.
resistance to defoliation by, 516.
responses from irrigation, Wash. 190.
Rocky Mountain, handbook with plates and distribution maps, 457.
seed propagation for conservation planting, U.S.D.A. 454.
shade, fungicides for, 360.
shade, insecticides and spreaders for, 367.
shelterbelt, *see* Shelterbelt.
Trematodes—
avian, from India, morphology and classification, 254.
gut contents, hematological studies, 686.
morphology, in intestine of fowls, 401.
*Triatoma* spp. in Tucson area of Arizona, 220.
*Tribolium castaneum*, *see* Flour beetle, red.
*Trichinella spiralis*—
development, effect of short electric wave radiation on, 395.
in swine in United States, 821.
Trichiniasis in rats, immunity to, 821
Trichinosis—
in an American badger, 395.
in Canada, incidence in garbage-fed hogs, 250.
*Trichoderma*, use for biological control, need of reinvestigation, 204.
*Trichogramma minutum*—
artificially reared for sugarcane borer control, P.R.Col. 651.
experimental work, 658.
notes, Mo. 798.
*Trichomonas*—
*foetus*, cultivation, 245.
*foetus*, cultural diagnosis, simple medium for, 397.
spp. in domestic animals, biology and pathogenicity, 820.
vaginitis, pathology and vaginal implants with *Trichomonas vaginalis* and *T. intestinalis*, 820.
Trichomoniasis—
bovine, S.C. 540.
in Utah Experiment Station dairy herd, 110.
of cattle, experimental transmission, 110.
*Trichonema* spp. infestation in Philippine horses, 251.
*Trichopoda pennipes*—
notes, Fla. 650.
parasitic castration of *Anasa tristis* by, effect on reproduction, 373.
*Trichopria*—
*angustipennis*, notes, 525.
*paludis*, notes, 525.
*Trichostrongylus*—
*axei*, efficacy of nonconditioned phenothiazine against, 543.
*calcaratus* parasite of cottontail rabbit, 791.
*colubriformis* from sheep, rabbits as host, 827.
*Trichuris*—
*leporis* parasite of cottontail rabbit, 791.
sp., efficacy of nonconditioned phenothiazine against, 543.
*Trifidaphis phaseoli*, studies, U.S.D.A. 84.
*Triticum monococcum*, genetic analysis, Mo. 185.
Trout, insect food of, 650.
Truck crop insects, studies, U.S.D.A. 84.
Truck crops—
effect of atomized oil sprays on, Wis. 364.
fertilizer experiments, Fla. 624, Wash. 190.
fertilizer requirements, Wash. 190.
selection and breeding, Wash. 190.
soil fertility studies with, Fla. 625.
variety tests, Wash. 190.
Truck farming in Copiah County, receipts, expenses, prices, etc., Miss. 262.
*Trypanosoma*—
*equiperdum*, growth in developing chick embryo, 108.
*equiperdum*, method for preserving, 542.
*rhodesiense*, rabbits cured of, protracted immunity in, 821.
*theileri* and turning sickness of cattle, 397.

Trypanosomes—
antigenic composition and immunizing properties, 821.
cultivation in developing chick embryo, 108.
nature of blepharoplasts of, 820.
Trypanosomiases, experimental, mechanism of resistance to, 821.
Trypetinae of China, key to genera, 224.
*Trypodendron* spp.—
and associated fungi, 378.
on aspen and paper birch and associated ambrosia fungi, 81.
Tubercle bacilli—
avian bovine type, nature of dissociation of, 822.
avian, pathogenicity for cattle, 677.
bactericidal effect of serum from the tuberculous on, 822.
in hen's eggs, 108.
Tuberculin—
reactions in cattle, due to human type of tubercle bacillus, 679.
tests, double intradermal, relation between skin measurements and character of swelling, 824.
Tuberculosis—
anacoresis in, 822.
and tuberculin intoxication, effect of vitamin C on, 822.
avian, in poultry and swine, field control and eradication, 677.
bovine and human strains, differentiation, 679.
experimental, effect of sulfanilamide on, 824.
immunity induced in calves by B. C. G., duration of, 247.
immuno-serological test for, value, 822.
in elk, 685.
in guinea pig, sulfonamide treatment, 822.
in man as source of infection for cattle, 108.
in sheep, 544.
naturally acquired, location and type of pulmonary lesions in cattle with, 822.
pathology and pathogenesis in domesticated animals v. man, 395.
pulmonary, in cattle, location and type of lesions, 825.
reaccreditation of modified accredited counties in New York, 677.
situation, general, 677.
Tuberose root knot, bulb treatments for, 500.
Tularemia—
in beaver in Montana, 246.
in beaver in Wyoming, and transmission to man, 246.
relation to ticks, 541.
tick-transmitted, discussion, N.J. 228.
Tulip—
beds, microclimate and growth in, 447.
*Botrytis* blight, U.S.D.A. 500.
bulb diseases, control, West.Wash. 202
Tulip—Continued.
failures due to fungi, U.S.D.A. 635.
gray bulb rot, U.S.D.A. 500.
virus in lilies, 71.
Tumor grafts, resistance to in offspring of immunized rats, 43.
Tumors—
avian, incidence and classification, 112.
benign intestinal, problem of virus etiology, 820.
chicken, nature of, 820.
infective and noninfective, differentiation between and response to radium treatment, 820.
mammalian, viral origin, 820.
mammary, in rabbits, breeding history of two types, 476.
Tuna fish, ventral and dorsal parts, vitamin D potency, 717.
Tung trees—
flowering, fruiting, yield, and growth habits, Fla. 341.
minor element deficiency symptoms, 780.
propagation, planting, and fertilizer tests, Fla. 624.
studies, P.R.Col. 625.
varieties, Ga.Coastal Plain 625.
Tupelo leaf spot, 648.
Turf—
dusting, new machine for, 87.
fine, establishing and maintaining, N.J. 617.
making, R.I. 333.
Turkey—
carcasses, predicting quality, use of body measurements, Ky. 528.
disease control, in commercial flocks, 678.
eggs, size and shape, Mo. 229.
eggs, turning during incubation, Ky. 528.
meat, flavor, effect of cod-liver oil and fish meal on, 388.
poult mortality due to grasshopper-poison bait, 685.
poults, brooding, N.J. 237.
poults, carbon monoxide poisoning due to poorly ventilated brooders, 253.
poults, perosis prevention by choline, 813.
poults, use of proteins from different sources, Nebr. 805.
Turkeys—
bone deformity of leg joints, relation to blood mineral ratios, Utah 391.
egg production, effect of all-night lighting, Mo. 229.
feeding and management, Ohio 237.
feeding system during finishing period, Nebr. 805.
field feeding of grain sorghums to, Nebr. 805.
four strains, variations in earliness of maturity and size and quality, Nev. 529.
growth and quality, effect of different cereals, Wyo. 530.

Turkeys—Continued.
- holding for spring market, merits of, Miss. 529.
- mineral requirements, Wash. 229.
- production in Utah, Utah 535.
- raising in confinement to prevent parasitic diseases, 547.
- raising, vegetable protein concentrates for, Mo. 99.
- recessive slate plumage color of, 611.
- value of rye for, Wyo. 530.
- vitamin D requirements, Wash. 229.
- with bone deformity, percentage of calcium and inorganic phosphorus in blood serum, 534.

Turning sickness of cattle and *Trypanosoma theileri*, 397.

Turnip—
- aphid, studies, U.S.D.A. 84.
- clubroot resistant varieties, 79.
- greens, mineral composition, comparison under various environmental conditions, S.C. 439.

Turnips, Amber Globe, vitamin A values, Tenn. 564.

Tussock moth, hickory, toxicity of nicotine to, 653.

Twig girdler—
- notes, 662.
- Texas, notes, 662.

Twins, but not full sisters, 756.

*Tyloderma fragariae*, *see* Strawberry crown borer.

*Typhoid, avian, see Fowl typhoid.*

*Typhula* spp. associated with snow molds of cereals and grasses, 73.

Tyrosine metabolism, 230.

Udders, extreme rarity of cancerous growths in, 674.

Ugly-nest caterpillar, toxicity of nicotine to, 653.

Ultravirus, essence of, 345, 819.

U. S. Department of Agriculture—
- Appropriation Act, 1941, 577.
- Bureau of Agricultural Economics, *see* Bureau of Agricultural Economics.
- Office of Experiment Stations, *see* Office of Experiment Stations.
- organization directory and field activities, U.S.D.A. 267.
- publications, citations to literature in, U.S.D.A. 863.

University—
- of the Philippines, notes, 720.
- relations to forest influences research, 125.

Urea—
- as protein supplement replacement for dairy heifers, 382.
- hydrolysis in soils by thermolabile catalysis, 312.
- ingestion, effect on nitrogen balance and energy metabolism of rats, 231.
- nitrogen, use by cattle and by swine, Hawaii 528.
- nitrogen, use by chickens, Hawaii 528.

Urea—Continued.
- utilization by ruminants and its stability in feeds, Wis. 95.

Uredinales of New Guinea, 636.

*Uredo*—
- genus, new taxonomy for, 204.
- new species, 636.

Uric acid in mixed excrements of birds, determination, 153.

Urinary calculi—
- formation on low phosphorus diet, 129.
- in lambs, feeding experiments for study, Colo. 808.
- in wethers, failure of dietary magnesium imbalance to produce, 545.

Urinary excretion of vitamin $B_1$ by normal individuals and beriberi patients, 279.

Urine—
- androgens excreted in by bulls, 588.
- ascorbic acid in after oral administration of vitamin C, 422.
- gelding, effect on reproductive system of rats, 614.
- thiamin in, chemical determination, stability, and form, 731.
- vitamin C in, determination, 730.

*Urocystis*—
- *occulta* in culture, spore germination and growth, 637.
- status of generic name, 502.

*Uromyces*—
- *appendiculatus*, notes, Wash. 202.
- *caladii*, variations in systemic infections, 204.
- *graminis*, host selection by, 503.
- new species, 636.

Uropygial gland in chickens and turkeys, characteristics of oil, Ky. 528.

Ustilaginales, additions and corrections to, 204.

*Ustilago*—
- *bullata*, haplolethal deficiency preventing saprophytic development, 471.
- *hordei*, physiologic races in Alberta, 74.
- spp., new races, Wash. 202.
- *striaeformis*, new race, studies, 73.
- *vaillantii* on *Bellevalia*, U.S.D.A. 201.
- *zeae*, cultural and genetic studies, 348.
- *zeae*, resistance of corn strains to, Iowa 68.

Utah College, notes, 288.

Utah Station, notes, 288.

Uterus—
- effect on corpus luteum, 330.
- physical conditions governing duration of pregnancy, 47.

Vagina, artificial, for use in semen collections for artificially inseminating dairy cattle, 757.

Vaginal bleeding, prolonged and fetal resorption in Albany strain of rats, 47.

Valine, effect on hemoglobin production in anemia, 572.

*Valsa sordida*, biology, 513.

Veal production, profitableness, Ga.Coastal Plain 866.

Vedalia, maintenance of supply, P.R.Col. 651.
Vegetable—
disease-resistant varieties, progress in development, 511.
diseases—
and pests, 210.
control, N.J. 635, Ohio 501.
due to *Rhizoctonia*, control, Fla. 634.
fixed copper fungicides for control, 511.
newly reported in Oregon, U.S.D.A. 344.
on New York market, U.S.D.A. 343.
seed- and soil-borne, Fla. 634.
virus, in Ordzhonikidze Region, 784.
leaf blights, Fla. 634.
seeds, deterioration and methods for prevention, U.S.D.A. 487.
seeds, germination of treated and untreated lots, field studies for comparing, Iowa 68.
seeds, production, N.Mex. 57.
weevil may survive January temperature, Miss. 143.
weevil, studies, Hawaii 517.
Vegetables—
available iron in, 704.
cooked in fat, calcium and phosphorus in, 273.
copper sprays for, Mass. 783.
cover crops for, Ark. 56.
culture experiments, Can. 336.
damping-off of early forcing varieties, control, Mass. 783.
fertilizer placement methods, Fla. 625.
fertilizers for, Ark. 56.
Florida, composition of ash, Fla. 581.
for panhandle area, Okla. 190.
freezing, West.Wash. 190.
freezing preservation, research project, Utah 412.
frozen, bacteriological flora during spoilage, 346.
frozen, commercial packs, microbiological studies, 154.
frozen, enzyme activity in, 154.
frozen, industry, N.Y.State 772.
growth and yield, relation to soil reaction, Fla., 624.
growth, yield, and quality, effect of green manure, Fla. 624.
Hawaiian-grown, analyses, Hawaii 562.
Hawaiian-grown, vapor-heat treatment for, Hawaii 772.
importance of minor elements in, 599.
iron and other minerals in, Fla. 581.
irrigation, Tenn. 489.
manure experiments with, Ark. 626.
methods of application of fertilizer and sources of N for, Ark. 56.
mineral constituents, effect of cooking and canning, 701.
mineral content, Fla. 699.
minor, Fla. 625.
nicotinic acid in, 713.
Vegetables—Continued.
North Dakota-grown, sharp freezing for cold storage lockers, N.Dak. 560.
nutrition studies, 490.
of Florida, vitamin C content, Fla. 699.
of Texas, iodine in, 275.
preparation, freezing, and storage, N.Y.State 701.
protection by wax emulsion, Tenn. 489.
quality, relation to fertilizers high in potash, Mo. 189.
quality, reliability of retail prices as guides to, Ohio 116.
raw and cooked, carotenoids in, 707.
response to phosphate fertilizer, 57.
root knot nematode control on, Fla. 634.
selection of genetic strains high in minerals and vitamins, Me. 411.
spraying with fixed coppers, injurious effects, Ohio 210.
studies, Ohio 772.
tests in toxic orchard soils, 628.
uptake of nutrients by, effect of soil reaction, Ark. 57.
value of barnyard manure for, Ark. 56.
varieties—
adaptability, effect of mineral deficiencies, Fla. 624.
and strains adapted to commercial use, development, Fla. 624.
for Colorado conditions, Colo. 190.
for peat soils, Wis. 336.
variety tests, Can. 336, Fla. 625, Ga.Coastal Plain 625, Hawaii 488, Me. 335, Mo. 189, N.H. 772, S.C. 488, West.Wash. 190, Wyo. 489.
vitamin $B_1$ assays, 132.
vitamin C in, 135.
vitamins in, N.Y.State 848.
yields, relation to K, N.J. 625.
Vegetation—*see also* Flora *and* Plants.
in Wah Wah Valley in Utah, effect of unrestricted grazing, 483.
of southwestern Puerto Rico, 745.
types in Escalante Valley, Utah, as indicators of soil conditions, U.S.D.A. 743.
Velvet ants, Neotropical genera, revision, Minn. 379.
Velvetbeans—
after corn, winter grazing, returns from, Ga. Coastal Plain 666.
and corn, ground v. unground mixtures, with and without molasses, for fattening steers, Fla. 666.
culture experiments, Ga.Coastal Plain 617.
variety tests, Ga.Coastal Plain 617.
*Venturia*—
*inaequalis*, variability and inheritance in, 349.
*pirina*, heterothallism in, 349.
Vernalization—*see also specific crops.*
and growth-phase concept, 35.

*Verticillium*—
disease on elm and maple, control, Ohio 501.
isolations in Illinois, U.S.D.A. 201.
wilt of elm, U.S.D.A. 782.
*Vespula arenaria*, new parthenogenetic dermestid beetle taken from nest of, 226.
Vetch—
as cover crop for apple orchards, Ark. 56
bruchid control by fumigation of seed, U.S.D.A. 216, 227.
bruchid, studies, U.S.D.A. 84.
downy mildew in Oregon, U.S.D.A. 344
nodule bacteria, longevity, factors affecting, 55.
placement of dolomite, superphosphate, and basic slag for, 761.
root rot and associated fungi, 780.
root rot, notes, 782.
seed, fumigation for vetch bruchid, U.S.D.A. 216, 227.
stem scald and leaf spot, 641.
Veterinary—*see also* Animal diseases.
medicine, experiment station research in, editorial, 433.
Vial holder, description, 588.
*Vibrio fetus* recovery from aborted bovine fetuses and role in abortion, 678.
*Villadia*—
*elongata* n.comb., notes, 169.
history and status of genus, 169.
Villages, agricultural, changes in social organization, 124.
Virginia—
Polytechnic Institute, notes, 575.
Station, notes, 575.
Virgins-bower, processing seed of, U.S.D.A 618.
Virus—
action, nature and mechanism, 345.
and insect vectors, relations, 345.
disease research, new views in, 205.
diseases with cultivated plants, 205.
forms as primitive stages in bacterial life cycles, comparative morphology, 345.
mutant relations, acquired-immunity test and limitations for establishing, 345.
mutants, studies, 345.
Viruses—
and bacteriophages, ultracentrifugation and serological reactions, comparison, 345.
and carcinogenic chemicals, 820.
and nonvector insects, 345.
biochemistry, 745.
cultivability by different methods of tissue culture, 345, 819.
different within same host, forms and types of X-bodies formed by, 346, 820.
fibroma-myxoma spectrum of, 820.
in Hawaii, and hosts, check list, U.S.D.A. 345.
nature of, 345, 394, 819.
neoplastic, as conditioned by age of host, effect, 820.
Viruses—Continued.
phytopathogenic, nomenclature and classification, 345.
properties of, 345.
recent advances in study, 204.
Vitamin A—
absorption by dogs, 667.
accumulation in egg yolk and in liver of chick, 416.
action on experimentally produced skin wounds, 425.
activity in pea cannery refuse, West. Wash. 238.
and $A_2$, comparison by distillation, 729.
and butter color, 102.
and carotene in milk, determination, 668.
and carotene, relation to serum lipids, 564.
and dehyrated alfalfa hay, relative efficiency, 675.
crystalline esters of, preparation, properties, and potency, 297.
deficiency—
and cerebrospinal fluid pressure, 675.
detecting, adaptometer as instrument for, Mass. 843.
effect on gastrointestinal tract, 848.
effect on structure of gonads and pituitary gland, Ohio 535.
effect on vitamin C in the bovine, 675.
effect on young bulls, 675.
in dogs and rabbits, hematology of, 685.
in normal and tuberculous persons, biophotometer test, 417.
reliability of dark-adaptation test for, 277.
deficient rats, changes in pituitary glands of, Ohio 184.
determination by destructive irradiation, 728.
determination with photoelectric colorimeter, 729.
determinations by rat growth tests, 416.
effect on thrombocytes and bone marrow, 709.
effect on urea clearance in rat, 565.
in blood, determination, 297.
in blood during fever, 417.
in blood of normal adults, effect of depletion diet, 708.
in liver oil of snapper shark, 130.
in livers of healthy dogs, 530.
in milk, effect of feeding pea vine silage, 815.
in nutrition of dairy cattle, 99.
in nuts, 707.
in soybeans and cowpeas, 531.
in tomato juice commercially canned, 416.
nutritional status for, biophotometer test as index, 848.
photocolorimetric determination in human plasma, 708.

Vitamin A—Continued.
- picture in serum, pathogenic and diagnostic significance, 709.
- potency, effect of treated fats on, 131.
- preparations, purity and activity of, 728.
- recent research in, 415.
- requirements—
  - for growth of dairy cattle, 391.
  - in infancy, as determined by dark adaptation, 849.
  - of adults, 278, 707.
  - of chickens when fed as carotene, Tex. 390.
  - of dairy cows for high vitamin A value of butter, 675.
  - of poultry, 385.
- rich concentrate from butter, preparation and determination in Pulfrich photometer, 727.
- values of foods, effects of cooking and storage, Tenn. 564.

Vitamin $A_2$ cyclization, 730.

Vitamin—
- antihemorrhagic *see* Vitamin K.
- antineuritic, *see* Vitamin $B_1$.
- antirachitic, *see* Vitamin D.

Vitamin $B_1$—*see also* Thiamin.
- action in animal experiments, 418.
- and cocarboxylase in organs, determination, 712.
- and manganese, metabolic interdependence, 565.
- as growth regulating substance for green plants, N.J. 597.
- complex nature of, Wis. 126.
- complex, significance in human pathology, 425.
- deficiencies, clinical neurologic aspects, 711.
- deficiency in animals and man, blood picture and symptoms, 668.
- deficient rats, glycogen in liver of, 712.
- determination, 11.
- determination in pure preparations, food, and urine, 279.
- diphosphate in blood, 419, 420.
- from pyrimidine and thiazole portions by animal tissues, synthesis, 850.
- in cerebrospinal fluid, estimation, 420.
- in foods, bradycardia method of determining, 419.
- in nuts, 707.
- in royal jelly and bee bread, 378.
- in soybeans and cowpeas, 531.
- in wheat, flour, and bread, 417.
- injection studies, 566.
- metabolism, 279.
- metabolism in rats studied by *Drosophila* sterile culture method, 418.
- metabolism, usefulness of thiochrome procedure for study, 566.
- need for addition to staple American foods, 711.
- new chemistry of, and control of beriberi, 425.
- new color reaction for, 443.

Vitamin $B_1$—Continued.
- of blood in health and disease, 280.
- of foods in terms of crystalline thiamin, U.S.D.A. 131.
- requirement, 425.
- requirements and thyroid activity, 280.
- therapeutic uses, 417.
- utilization, endogenous disturbance in, 419.

Vitamin $B_2$ complex, yeast eluate factor, 711.

Vitamin $B_6$—*see also* Pyridoxin.
- and factor U, relation, 383.
- and skin lesions in rats, 713.
- and unsaturated fatty acids, supplementary relations, 668.
- deficiency in rat, histopathology of, 568.
- importance in nutrition of dogs, 236.
- in New Mexico pinto beans, effect of cooking, 422, N.Mex. 126, 421.
- isolation and synthesis, 422.
- preparation from natural sources, 730.
- requirement by chicks for maintenance and growth, 534.
- requirement in human nutrition, 281.
- studies, Wis. 126.

Vitamin B complex—
- components, requirements for lactation, Ark. 127.
- deficiency, effect on gastrointestinal tract, 848.
- deficient rats, carbohydrate, fat, and protein appetite, 132.
- factors concerned with gastrointestinal function, 567.
- factors, importance in nutrition of dogs, 236.
- factors in meat and meat products, 276.
- in rumen of cow, synthesis of members, 668.
- new anti-gray factor of, 667.
- recent research in, 415.
- relation to animal nutrition, 383.
- relation to nutrition of chick and pigeon, 385.
- requirements of rats, 280.
- role in weight restoration in pigeon, 667.

Vitamin C—*see also* Ascorbic acid.
- and aging eyes, 138.
- and carotene in forage crops, 745.
- consumption, effect of increase in vitamins $B_1$ and $B_2$, 135.
- content of Florida fruits and vegetables, Fla. 699.
- deficiency, effect on gastrointestinal tract, 848.
- deficiency, relation to nutritional anemia, 138.
- destruction in kitchenette sauerkraut on cooking, Wis. 126.
- effect on lead poisoning, 854.
- for sterile or partially sterile sires, 674.
- free diet of a man for 160 days, effects, 715.
- in apples, effect of light, 423.
- in black currant sirup, photochemical decomposition, 715.

Vitamin C—Continued.
- in blood and fever metabolism, relation, 570.
- in blood, on diets rich and poor in vitamin C, 716.
- in canned tomato juice, effect of presence of iron and tin, Ark. 126.
- in D'Anjou pears, Wash. 268.
- in frozen-pack peas, factors affecting, Wash. 268.
- in frozen raspberries, varietal differences, Wash. 268.
- in fruits and fruit products, vegetables, and other plants, 715.
- in fruits and vegetables, N.Y.State 848.
- in fungus extracts, 598.
- in milk, effect of feeding cod-liver oil, 673.
- in nutrition of dairy cattle, 675.
- in rats, effect of copper and various organic substances, 853.
- in tomatoes, relation to acidity, 854.
- in tonsils, and relation to their protective function, 422.
- in urine, determination, 730.
- in vegetables, 135.
- metabolism, effect of nicotine on, 716.
- minimum requirement by normal person, Utah, 569.
- nutrition, determination by skin test, 569.
- recent research in, 415.
- recovery from human bladder, 569.
- requirement, 425.
- requirements of college women, Wash. 268.
- synthesis and excretion, acceleration by feeding known organic compounds to rats, 281.
- synthesis and excretion by rats, 281.

Vitamin, chick antidermatitis, identity, Wis. 95.

Vitamin D—*see also* Vitamin, antirachitic.
- activity, biological estimation, effect of phosphorus on, 856.
- activity of cacao shell meal, Mass. 813.
- and radioactive phosphorus, fed to rachitic rats, 284.
- bio assays, 571, Mass. 843.
- deficiency, effect on gastrointestinal tract, 848.
- deficiency of dairy cattle, relation to blood plasma magnesium, 675.
- for rats, cocoa shell meal as source, Mass. 843.
- in liver oil of snapper shark, 130.
- in salmon meal, effect of methods of preparation and storage, Wash. 229.
- potency of fish and fish products, 717.
- quantitative estimation with growing chicks, 385.
- recent research in, 415.
- requirements of turkeys, Wash. 229.
- synthesis of, studies, 585.

Vitamin $D_2$ and $D_3$ in infantile rickets, comparison of therapeutic efficiency, 856.

Vitamin E—
- activity of α-tocoquinone, 284.
- bibliography, 423.
- deficiency, effect on gastrointestinal tract, 848.
- deficiency, prolonged in rats, effect, 231.
- injections for difficult breeding in dairy cows, 391.
- potency of feeds, 675.
- prevention of muscular dystrophy in guinea pigs with, 669.
- recent research in, 415.

Vitamin G, *see* Riboflavin.

Vitamin K—
- activity—
  - in benzoquinone series, 736.
  - in simple compounds, 14.
  - of naphthoquinones, 14, 585.
  - of quinones, 15, 16.
  - of 2-methyl-1,4-naphthoquinone, 284.
- biological assay, 12.
- biological assay, and application to several quinone compounds, 423.
- choleic acid of, effect on prothrombin levels of bile fistula rats, 572.
- clinical and experimental studies, 423.
- concentrates, color reactions in, 14.
- control of prothrombin deficiency in obstructive jaundice by, 424.
- deficiency, effect on gastrointestinal tract, 848.
- deficiency in normal and sick infants, 285.
- feeding for low infant prothrombin levels, 424.
- from alfalfa, 298.
- isolation from alfalfa, and history of its discovery, 733.
- nutritional deficiency of, in man, 285.
- outline of research on, 856.
- physicochemical concentration, 445.
- potencies of synthetic compounds, 857.
- progress in research of, 284.
- properties, 386.
- recent research in, 415.
- therapy in obstructive jaundice, 285.

Vitamin $K_1$—
- and 2-methyl-3-phytyl-1,4-naphthoquinone, identity, 586, 587.
- blue alkali salt of, 734.
- constitution and synthesis, 586, 734.
- derivatives of, 13, 735.
- identification, 734.
- isolation, 13, 733.
- $K_2$, and related compounds, ultraviolet absorption, 736.
- natural and synthetic, 139.
- nor-, and related compounds, 735.
- preparations and 2-methyl-1,4-naphthoquinone, antihemorrhagic activity, comparison, 736.
- structure, 15.
- synthesis, 735.
- synthetic approach to, 586.

Vitamin $K_2$—
derivatives of, 13.
isolation, 13.
isolation from commercial sardine meal, 737.
Vitamin nutrition, advances in, 95, 382.
Vitamin P, a capillary fragility control factor, 857.
Vitamin studies, development of highly purified diets for use in, Mo. 229.
Vitamins—
and related substances in yeast, 707.
deficiency of, *see* Avitaminosis *and specific vitamins.*
effect on growth of crown gall, 346.
in animal organs, Wis. 126.
in cabbage and onions, effect of winter storage, Mont. 276.
in wheat, 707.
recent research in, 415.
water-soluble, site of action of, 711.
*Vitis*, species and hybrids, characterization, 169.
*Vitula edmandsii* in honeybee combs, 94.
Wall construction, relation to moisture accumulation in fill-type insulation, Iowa 550.
Walnut—
caterpillar and its natural enemies, Mo. 798.
caterpillar, toxicity of nicotine to, 653.
growth, effect of root temperature, 62.
trees, lumber and nut production, Ark. 65.
trees, young, importance of soil pore space to, N.Y.State 194.
Walnuts—
black, judging schedule for, 631.
black varieties, shuck : nut ratio in, 631.
variety tests, N.Mex. 57.
vitamins A and $B_1$ in, 707.
Warblers of New Jersey, transient, N.J. 650.
Wartime profits, Uruguay imposes tax on, U.S.D.A. 120.
Washington College, notes, 432, 719.
Washington Station, notes, 144, 432, 719.
Washington Station, report, 287.
Wasp, small pteromalid, biology, 227.
Wasps, Neotropical mutillid, revision of genera, Minn. 379.
Water—
absorption, decreased, by plants in poorly aerated media, causes, 600.
city, of Texas areas, iodine in, 275.
conservation, contour farming for, Iowa 549.
control, studies, Fla. 687.
culture, *see* Plants, culture.
duty of, *see* Irrigation water.
filtration by oysters, N.J. 651.
heating for livestock, electrical, Nebr. 828.
iodine determination in, 300.
irrigation, *see* Irrigation water.
mineral composition, Fla. 699.
movement in soil, N.J. 592.
of Big Horn River, Wyo. 454.
Water—Continued.
pasture, studies, Fla. 616.
resources and geology of Harney Basin, Oregon, 402.
resources of Colorado, 21.
resources of river basins in Nevada, inventory and history, Nev. 548.
shortage predicted unless abundance of precipitation before May 1, Utah 304.
supply of United States, Pacific slope basins in Washington and upper Columbia River Basin, 402.
systems, automatic electrical, Nebr. 828.
Waterfowl, danger of lead shot to, 515.
Watering trough, electrically heated automatic, description, 114.
Watermelon—
diseases, control, Fla. 634.
wilt-resistant varieties, breeding, 780, Ga.Coastal Plain 625.
Watermelons—
culture experiments, Ga.Coastal Plain 625.
fertilizer experiments, Ga.Coastal Plain 625.
fruit setting, 774.
manure experiments with, Ark. 626.
thinning of fruits, Ark. 57.
total soluble solids and sugars in varieties, Calif. 337.
varieties, Mo. 190.
variety tests, Ga.Coastal Plain 625, S.C. 488.
Winter Queen, rot caused by *Phytophthora capsici*, 512.
Watershed protection, U.S.D.A. 497.
Wax moth—
length of development, 798.
proxate, methyl bromide, and chlorosol as fumigants for, tests, 222.
Weather—*see also* Meteorological observations *and* Meteorology.
changes, relation to sunspot changes, 447.
conditions for 1937, summary, Ohio 446.
data, Ga.Coastal Plain 589.
factors, relation to wheat yields, U.S.D.A. 591.
forecast and frost warning service of Florida Station, Fla. 589.
forecasting, long-range, recent Australian papers on, 738.
station, unmanned, radio equipment for, 738.
ten years of large-scale studies, 738.
Webworm—
fall, easily parasitized by *Nosema bombycis*, 525.
fall, insecticides and spreaders for, 367.
Hawaiian beet, control, Va.Truck 369.
Webworms, sod—
control in lawns and putting greens, Wis. 334.
in pasture and cultivated fields, Iowa 85.
Weed problem of Upper Peninsula, Mich. 487.

Weed seed in soil, chloropicrin for killing, Ohio 480.
Weeds—
control, Nev. 481, Wis. 333.
control activities and accomplishments under State program, Utah 335.
control by cultivation, Miss. 617.
control in hayfields, Wis. 333.
control in lawns, tests of Sinox for, Ohio 480.
control, new selective spray for, Calif. 55.
duration of effects of renovation in control of, 55.
eradication in lawns, Tenn. 481.
eradication in tame pastures, Fla. 616.
interception of rainfall by, 590.
of cranberry bogs, control, Wash. 185.
of United States, descriptions, 623.
Weevils from eggs in raw materials, 803.
Western Washington Station, report, 287.
Wheat—
and corn acreages, response to changes in ratio of corn price to wheat price, Iowa 116.
and wild rye hybrid grass, claims regarding, without foundation, Colo. 863.
as nurse crop with crested wheatgrass, Wash. 185.
average yields per acre in Ohio, Ohio 257.
bran v. alfalfa hay v. cottonseed meal as protein supplements to silage in winter rations for calves, 384.
breeding, Mo. 185, Nebr. 759, Wash. 185.
breeding for disease resistance, Tenn. 501.
bulk, handling in Australia, 695.
bunt, *see* Wheat smut, stinking.
*Cercosporella* foot rot of, U.S.D.A. 783.
cold resistance, factors affecting, Nebr. 760.
composition, effect of variety, season, and green manures, 770.
corn and hay in rotation, residual effects of limestone, Ky. 479.
culture experiments, Ga.Coastal Plain 617, Wash. 185.
decomposition, transformation of phosphorus during, 313.
diseases, losses from, U.S.D.A. 201.
diseases, problems, 503.
effect of acreage on returns on dry farms, Wyo. 552.
effect of awns on kernal weight, test weight, and yield, 756.
fertilizer experiments, Del. 48, Wash. 185, Wyo. 481.
flag smut, seed disinfection tests, irregular results in, 350.
flour, *see* Flour.
from Saskatchewan, selenium in, 727.
germ oil injections for difficult breeding in dairy cows, 391.
germ oils, preventive effect in nutritional muscular dystrophy, 382.
Wheat—Continued.
glume blotch in West Virginia, U.S.D.A. 783.
gluten thermal fractionation, amino acid in proteins resulting from, 293.
hard red spring varieties, comparative data, 702.
Hope, origin and history, 335.
improvement, Colo. 754.
in farm storages, ventilation methods, U.S.D.A. 687.
laboratory, Federal, U.S.D.A. 770.
leaf rust, studies, 503.
loose smut—
control by vacuum treatment, 346.
infection, reaction of winter varieties to, U.S.D.A. 503.
machine for control, Okla. 74.
notes, U.S.D.A. 782.
spores, dissemination, 503.
meal-time-fermentation test, 295.
mills, Allis-Chalmers and Buhler automatic, comparison, 295.
mineral constituents and vitamins, 707.
minerals of, relation to human and animal nutrition, Utah 273.
mosaic in Voronezh Province, 784.
New Zealand aims at self-sufficiency in, U.S.D.A. 120.
offgrade, in Oklahoma, causes, Okla 486.
phosphorus absorption by, effect of lime and phosphorus applications, 173.
planting tests, Nebr. 760.
*Pythium* root rot, effects of soil amendments, 640.
quality and cold resistance in, inheritance and interrelations, U.S.D.A. 770.
response to fallow and other tillage practices, Nebr. 760.
rusts—*see also* Cereal rusts, Rusts, Wheat leaf rust, *and* Wheat stem rust.
in Indiana and Kansas, U.S.D.A. 783.
sagging of grain heads and straw breakage, Ohio 548.
scab, reports on, U.S.D.A. 782.
scab, studies, 503.
seed damaged by formaldehyde, germination and early growth, effect of, naphthylacetic acid on, 750.
seed treatment, 503.
seedlings, growth, effect of low concentrations of selenium, 748.
shorts for feeding pigs, Miss. 529.
smut, stinking—
from Afghanistan, U.S.D.A. 201.
Great Plains uniform nursery, summary of data, U.S.D.A. 503.
infection, effects of soil type, soil sterilization, and soil reaction, 350.
inheritance of resistance to, Wash. 202.
initiation of infection by, 639.
losses from in United States, 350.

Wheat—Continued.
smut, stinking—continued.
on winter wheat, seed treatment, Nebr. 783.
uniform nurseries in western region in 1939, results from, U.S.D.A. 503.
uniform nursery, 503.
smuts, new races, Wash. 202.
soybeans as green manure v. sodium nitrate as top dressing for, N.J. 618.
spring—
culture experiments, Wyo. 481.
outstanding varieties, N.Dak. 49.
varieties recommended, Nebr. 618.
variety tests, Nebr. 618, 759, Wash. 185, Wyo. 481.
yield, relation to depth of soil moisture at seeding time, U.S.D.A. 622.
yields and other data, Nebr. 618.
yields, effect of rainfall and evaporation, 159.
spring-sown, variety tests, N.Mex. 48.
starch, studies, 9.
stem rust—
epidemiology in Mexico, 206.
immune varieties, 207.
in crosses involving Iumillo, relation between seedling and mature plant reaction to, 639
in Texas, U.S.D.A. 344.
physiologic strains, distribution and importance, 503.
resistance and reaction to black chaff, genetic study, 41.
severe, in California, U.S.D.A. 635.
unseasonable germination of teliospores, 640.
straw, whole and cut, as bedding material, absorptive capacity, 535.
surface v. furrow drilling, Nebr. 760.
Thorne, merits, Ohio 480.
top dressing, effects of weather on returns, Ohio 480.
varieties, hard red spring, comparative performance, N.Dak. 55.
varieties, improved, registration, 55.
varieties, new, production at Phytotechnical Institute of Santa Catalina, 472.
variety tests, Ark. 48, Ga.Coastal Plain 617 Me. 333, Mo. 185, N.J. 617, S.C. 480, Tenn. 481.
vitamin $B_1$ in, 417.
whole, proteins, biological value, 530.
winter—
culture experiments, Wyo. 481.
nematodes injuring, 362.
outstanding varieties, N.Dak. 49.
scab destructive in Atlantic Coast States, U.S.D.A. 635.
scab resistance in, U.S.D.A. 770.
soft, disease resistance in, 785, U.S.D.A. 770.

Wheat—Continued.
winter—continued.
varieties in Nebraska, Nebr. 622.
variety tests, Nebr. 759, Wash. 185, Wyo. 481.
winter-sown, variety tests, N.Mex. 48.
yields, relation to weather factors, U.S.D.A. 591.
Wheatgrass—
Bluebunch, processing seed of, U.S.D.A. 618.
bunch, effect of grazing, 763.
crested—
culture experiments, Wash. 185, Wyo. 481.
Fairway, leaf pigment concentration, relation to yield in, 764.
nutritive value, Wash. 229.
seed responses, effect of maturity at time of harvest, 53.
yield, effect of shelterbelt, Wyo. 481.
Whey—
byproducts, utilization, Mass. 814.
dried, feeding value, 669.
from casein manufacture, utilization, 241.
mixtures which dry satisfactorily on atmospheric drum drier, properties, 674.
soluble proteins, denaturation by heat, 241.
White ants, *see* Termites.
White grubs—
biology and control, Ky. 800.
control in lawns and putting greens, Wis. 334.
distribution, Ky. 518.
identification, 516.
in bluegrass pastures, 55.
in eastern Canada, control, 801.
in forest nurseries of the Carolinas, U.S.D.A. 216.
problem of, papers, 516.
studies, Iowa 85.
White pine blister rust—*see also* Ribes eradication.
cankers, mycelial extent beyond visible canker margins, 647.
control, Ohio 501, U.S.D.A. 68.
resistance, selection for, Wis. 344.
studies, 360, 500.
White pine, western, current season's shoots resistant to blister rust infection, 361.
Whiteflies, control with lime-sulfur, Fla. 650.
Whitefly—
azalea, notes, Ala. 519.
citrus, on Satsuma orange, control, Ala. 794.
White-fringed beetle—
adult activities, 83.
and natural enemies, survey in South America, U.S.D.A. 216.
control with methyl bromide, 663.
studies, Ky. 518, U.S.D.A. 84.

Whitetop—
control, Nev. 481.
seed, spread in droppings of grazing cattle, Nev. 189.
Whitewash as repellent for potato leafhoppers on citrus, 87.
Wild life area, insect abundance, 517.
Williams, V. R., prizes in memory of, 720.
Wind—
direction recorder, portable, description, U.S.D.A. 18, 83.
erosion and sand dune control, list of references, U.S.D.A. 549.
on southern Great Plains, relation to crops, U.S.D.A. 165.
Windbreaks, *see* Shelterbelt.
Winery pomace, digestibility, Calif. 532.
Wireworm—
eastern field, Conn.[New Haven] 517.
Pacific coast, studies, U.S.D.A. 84.
prairie grain, control, relation to summer-fallow, N.Dak. 226.
sugar beet, studies, U.S.D.A. 84.
Wireworms—
control with dichloroethyl ether, 377.
injury to potatoes, Conn.[New Haven] 652.
injury to tobacco from, control, 376, Ky. 518.
studies, Fla. 651, Wash. 217.
Wisconsin Station, notes, 719.
Wisconsin Station, report, 143, 430.
Wisconsin University, notes, 144, 719.
Witches'-broom on Virginia pine, 215.
Women—
college, mineral and nitrogen metabolism, Nebr. 845.
college students, diets of, 270.
college, vitamin C requirements, Wash. 268.
farm, means of improving economic status of family, Miss. 861.
Indiana University, basal metabolism, 127.
Wood—*see also* Lumber *and* Timber.
and wood products, mechanical properties and structural uses, list of publications, U.S.D.A. 403.
lignin distribution in, methods for demonstrating, 605.
pink stain, caused by *Geotrichum* sp., 513.
plastics, adhesion in, origin and mechanism, 303.
pulp, simultaneous production with alcohols, oils, and resins by conversion of noncellulosic constituents of wood, U.S.D.A. 737.
swelling and crushing strength, effect of chemicals on, 828.
Woodcocks, banding, on Pennsylvania singing grounds, 793.
Woodlands, farm, effect of grazing on soil and climatic conditions, 200.
Woody—
ornamental plants, fertilization, Ohio 778.
plants of Iowa, keys, 169.
plants, seedlings and cuttings, control of damping-off of, Mass. 783.
plants, virus diseases in, methods requisite for proving, 346.
tissues, isolated, oxygen consumption, 601.
Wool—
and lamb production, costs and returns from, Ky. 551.
black fibers in, inheritance, Ark. 43.
fibers, fineness, estimating accuracy of two methods compared, 573.
fibers from five breeds of sheep, diameter relations, 717.
fineness and cross-sectional variability, estimating, U.S.D.A. 141.
raw, compressed volume as indicator of yield, 381.
sampling methods, factors affecting, Wyo. 530.
shrinkage, factors affecting, Wyo. 530.
shrinkproofing, developments in methods, 860.
value, based on grease weights unreliable, Utah 532.
Woolen mill, quality control in, 717.
Woolly aphid, *see* Apple aphid, woolly.
Worms, removing from alimentary canal of cattle, efficiency of nonconditioned phenothiazine against, 543.
Wound hormones—
intercellular, produced by toxic effect of heteroauxin, 172.
of plants, structure and synthesis of traumatin, 172.
Wyoming Station, notes, 719.
Wyoming Station, report, 574.
Xanthophyll—
leaf, chemistry and functions, 601.
production in plants, seasonal variations in, 317.
role in poultry ration, 667.
*Xordies indicatorius*, parasitic on *Leiopus nebulosus*, 379.
X ray diffraction analysis and application to study of plant constituents, 598.
Xylose as a cataractogenic agent, 573.
Yam diseases, control, P.R.Col. 635.
Yams, staking test, P.R.Col. 617.
Yautias—
fertilizer experiments, P.R.Col. 617.
seed piece test, P.R.Col. 617.
Yeast—
baker's, effect of saturated fatty acids on, 470.
cells, development, 468.
cells, time lapse motion photomicrographic studies, 468.
compressed, for bread making, preservation by freezing, Wyo. 562.

Yeast—Continued.
- fermentation rate, factors affecting, 468.
- irradiated, for poultry, Wis. 382.
- minerals in, spectroscopic analysis, 726.
- peptidase, chemically pure, 467.
- role in fermentation of tobacco, 486.
- vitamins and related substances in, 707.

Yeasts—
- asporogenous, forming a pseudomycelium, taxonomy, 467.
- film-forming, studies, 39.
- sexuality, developmental cycle, and phylogeny, 39.

Yellow-fever virus, use of ultracentrifuge in study, 819.

Yellow mite, notes, Ala. 519.

Yellow-spot virus, identity with spotted-wilt virus, 797.

Yolk sac of newly hatched chick, lipid content and changes during first month of life, 390.

Youngberry culture, Hawaii 488.

*Zea-Euchlaena* hybrids, inheritance of intergeneric differences in, 42.

Zebra caterpillar, studies, U.S.D.A. 84.

Zein hydrolysates, nutritive value, 667.

Zephiran for treatment of foot rot in cattle, 543.

Zinc—
- availability in soils, effect of pH, 166.
- chemical status in soil with methods of analysis, Calif. 31.
- deficiency, effect on tomato roots, 644.
- in foods, determination methods, Mass. 725.
- report on, Mass. 862.
- role in animal nutrition, Wis. 95.

Zinnia powdery mildew, control, Fla. 634.

Zinnias, types, characteristics, Pa. 64.

*Zizania aquatica*, botany and history, 597.

*Zonocerus variegatus*, notes, 219.

27 AUG 1942

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